EXPLOSIVE GAS MANAGEMENT PLAN INACTIVE SANITARY LANDFILL

Prepared For:

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1.0 INTRODUCTION

The following Explosive Gas Monitoring Plan (EGMP) has been developed for the evaluation of subsurface landfill gas migration at the West Lake Landfill Superfund Site, Operable Unit 2, specifically the Inactive Sanitary Landfill (ISL) sub-unit. This EGMP has been compiled in accordance with Missouri Department of Natural Resources (MDNR) regulations in effect at the time the landfill ceased accepting waste. In addition, the general framework of this EGMP includes items recommended for evaluation of subsurface landfill gas migration established in published U.S. Environmental Protection Agency (EPA) guidance.¹

The ISL is subject to regulation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Record of Decision (ROD) for Operable Unit 2, including the ISL sub-unit, was issued in July 2008. The requirements for landfill gas migration monitoring and control in 10 CSR 80-3.010(14) (2008) are considered relevant and appropriate requirements as set forth in the ROD, and therefore serve as the primary regulatory basis for this EGMP. These regulations are provided in Appendix A in addition to landfill gas sampling guidance published by the MDNR.

A general Site location map is illustrated on Figure 1. Operable Unit 2 is divided generally into three specific disposal sub-units. These include:

- Closed Demolition Landfill (CDL);
- Former Active Sanitary Landfill (a.k.a. Bridgeton Landfill); and,
- Inactive Sanitary Landfill (ISL).

ISL limits are illustrated on Figure 2 and are the focus of the EGMP. A general diagram of the entire site and spatial relationship of each sub-unit is illustrated on Figure 3-5, which was obtained from remedial investigation reports associated with other portions of the Site². Each sub-unit is

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¹ Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities, EPA-600/R-05/123a, September 2005.

² Remedial Investigation Addendum, West Lake Landfill Operable Unit 1, Engineering Management Support, Inc., January 25, 2018.

believed to be separated by natural geologic materials that remained in place during placement of waste in the various units or during excavation associated hard rock quarrying operations.

The ISL is located in the western portion of the Site, southwest of the CDL and west of the Bridgeton Landfill. Historic records indicate that the wastes disposed of in the ISL consist primarily of municipal sanitary wastes.

Data collected during the Operable Unit 2 Remedial Investigation (RI) indicated that a Remedial Action (RA) was warranted for the ISL. Accordingly, a Feasibility Study (FS) was prepared to evaluate the appropriate RA for the ISL under CERCLA. This included requirements for evaluation of potential landfill gas migration. This EGMP has been prepared in response to this requirement.

2.0 SITE ENVIRONS AND GAS MIGRATION MONITORING NETWORK

The entire West Lake Landfill Superfund Site consists of approximately 200-acres located within the City of Bridgeton, St. Louis County. The formal site address is 13570 St. Charles Rock Road. The Site is bounded on the north by St. Charles Rock Road and on the east by Taussig Road and agricultural land. Old St. Charles Rock Road borders the southern and western portions of the Site. Property north of the Site (across St. Charles Rock Road) is moderately developed with commercial retail and industrial operations. The property northeast of the Site is also developed for commercial uses. The property south of the Site is currently experiencing significant commercial development. The Earth City Industrial Park is adjacent to the Site on the west. The Site is now almost completely surrounded by commercial/industrial properties.

2.1 Topographic Setting

The Site is located in the eastern edge of the Missouri River flood plain. The Missouri River is located less than two miles west of the Site. The Site area is transitional between the alluvial flood plain immediately to the west and the loessial bluffs 0.5 mile to the east. The edge of the alluvial valley is oriented northeast to southwest through the center of the Site. Topography in the area is gently rolling. However, the Site's topography has been significantly altered by quarry activities in the eastern portion (Bridgeton Landfill) and placement of mine spoils (unused quarry rock) and landfilled materials in the western portion in which the ISL is located.

2.2 History of Waste Placement

The ISL, CDL and Bridgeton Landfill operating history is complex and includes numerous and specific disposal authorizations. A detailed discussion of these initial and subsequent waste disposal activities are documented in prior Site investigation reports.³ Disposal authorizations for the ISL were limited to municipal solid waste. Based on review of boring logs within the presumed

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³ Refer to Section 3.3.1, Remedial Investigation Addendum, West Lake Landfill Operable Unit 1, Engineering Management Support, Inc., January 25, 2018.

limit of waste (Appendix B), materials encountered are consistent with operation as a sanitary landfill.

Estimated waste boundaries are depicted on Figure 2⁴. Additional documentation of waste limits will be completed during Remedial Design (RD) "Existing Conditions" investigation, expected to be completed in August 2020. Unless these limits are modified via this field investigation or other information gathered pursuant to the RD, the estimated limits identified in Figure 2 will be used for development of this EGMP.

2.3 Radius of Evaluation

Consistent with conventional landfill gas migration assessments, and published EPA guidance⁵, a 1,000 foot radius from the presumed limit of waste is established within this EGMP for the purpose of evaluating off-site receptors. Off-site structures assumed to currently be occupied, or structures that can accommodate occupancy for periods of time exceeding one-hour or more, within 1,000 feet of the ISL boundary (currently assumed as the limit of waste) are illustrated on Figure 2. For the purpose of this EGMP, structures are defined as those having an enclosed occupancy space. Facilities that are considered "open" or not enclosed are also identified for reference. Those structures within the OU-2 Site boundary are not specifically identified as they are addressed in the EGMP previously prepared for the Bridgeton Landfill.

2.4 Potential Explosive Gas Migration Pathways.

Within the western perimeter of the site, and within a 1,000 foot radius from the assumed limit of waste in the ISL, potential subsurface pathways include a fiber optic system and embedded fence posts associated with the facility perimeter fence. In addition, a sanitary sewer parallels Old St. Charles Rock Road which services leachate discharge from the Bridgeton Landfill. It is noted that the location of this infrastructure is being formally documented by the Remedial Design

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⁴ For the purposes of this EGMP, estimated waste boundaries are assumed consistent with the site boundary established in the Remedial Design Work Plan previously issued for the facility.

⁵ Guidance for Evaluating Landfill Gas Emissions from Closed or Abandoned Facilities, EPA-600/R-05/123a, September 2005.

investigation (RD) via an "Existing Conditions" investigation, expected to be completed in August 2020.

Both the fiber optic and sanitary sewer are categorized as linear infrastructure that may intercept and transmit landfill gas to occupied structures via service entrances. However, within the 1,000 radius of the Site, no buildings that do not currently include gas alarms are known to have service entrances associated with these utilities.

2.5 Other Potential Sources of Explosive Gas.

Other potential sources of explosive gas at the facility are primarily associated with the adjacent Bridgeton Landfill. In addition, based on regional geology, the potential for lenses of buried naturally occurring organic materials associated with alluvial events cannot be discounted as potential sources of explosive gas.

2.6 Hydrogeologic and Geological Information.

The regional direction of groundwater flow is in a generally northern direction within the Missouri River alluvial valley, parallel or subparallel to the river alignment. The RI data indicate very flat gradients in the water table of the alluvial aquifer near the ISL. Groundwater characterization specific to the ISL, including evaluation of groundwater gradients, will be completed following investigation of Operable Unit 3.

The western portion of the ISL is also bounded by a flood control canal operated by the Earth City Levee District. Groundwater elevations under the ISL are expected to vary in response to canal water elevation and to a lesser extent, groundwater and leachate withdrawal via pumping well K-128, located at the southeast margin of the ISL (Figure 2). The primary importance of this interaction is potential variation in groundwater elevations within probable gas migration zones. Such fluctuation may alter gas migration patterns temporally, and thus must be considered in the placement and specifically depth of gas monitoring wells.

Based on review of stormwater application requirements set forth by the Earth City Levee District, stormwater canals are designed with a normal water surface elevation of 433.0 (Earth City Levee District datum). Various aerial surveys generally confirm the water surface resides at this elevation. Therefore, under the assumption of direct communication between the canal and alluvial deposits underlying the ISL, canal water surface elevations are assumed to impart significant influence on the depth of the unsaturated zone available for gas migration along the western perimeter of the ISL.

2.6.1 Natural Site Characteristics that May Act as Natural Impervious Boundaries to Gas Migration or Allow Natural Venting of Gas.

As previously indicated, groundwater elevations under and along the perimeter of the ISL are expected to vary in response to canal water elevation and to a lesser extent, leachate withdrawal from the pumping well K-128 (Figure 2). In terms of site characteristics that may influence gas migration, this interaction is deemed as the most significant with respect to factors that may influence the unsaturated zones available for gas migration.

In addition to groundwater, the perimeter berm present along the western boundary of the ISL may also impact gas migration. At this time, the composition of this berm is not known, but will be defined through the course of ISL RD investigations (anticipated to be completed the third quarter of 2020). If this berm is comprised of low permeability soils and was properly constructed as a gas and/or leachate migration barrier, it will represent an additional barrier to gas migration. However, characterization of this berm is not expected to significantly alter the proposed placement of gas migration monitoring wells identified in this EGMP.

2.6.2 Potential Explosive Gas Migration Pathways and Their Associated Explosive Gas Hazard.

The primary explosive gas migration pathway identified in this EGMP consists of the alluvial deposits underlying and surrounding the ISL, principally those on the western perimeter of the site.

As these deposits are expected to be highly variable in terms of gas transmissivity potential and may also vary in spatial terms, the principal concern regarding gas migration monitoring is adequate coverage of potential transmission pathways including potentially discrete zones of migration that may occur within complex and highly variable alluvial deposits.

In addition to these alluvial deposits, two utility corridors including fiber optic and a sanitary sewer run parallel to Old St. Charles Rock Road on the western perimeter of the ISL. Each represents a potential migration pathway. However, as gas must migrate through alluvial deposits prior to reaching these utility corridors, the alluvial deposits are considered as the primary migration pathway.

2.7 Identification of Other Sources of Explosive Gases.

As the ISL is located at a facility with multiple waste disposal units, there is potential for migration of explosive gas emanating from the Bridgeton Landfill through or around the ISL toward the proposed ISL monitoring network. At this time, significant direct communication between waste disposal units in terms of gas migration is not anticipated. While this assumption has not been formally confirmed based on completed site investigations, ongoing or proposed facility-wide investigations will further the understanding of potential communication between disposal units and relevant findings may be amended to this EGMP if significant to ISL gas migration monitoring.

In addition, due to the presence of a significant gas extraction system within the Bridgeton Landfill, the potential for gas migration from the Bridgeton Landfill to the proposed ISL monitoring system is deemed remote at this time. The potential for gas generation from isolated zones of naturally occurring organic materials deposited during formation of the alluvial deposits underlying the ISL must also be considered.

2.8 Geologic Cross Sections and Potential Natural Pathways.

The RI previously completed for Operable Unit 1 (OU-1) at the Site included development of geologic cross-sections that traverse the ISL. These cross-sections provide considerable insight into the position of the ISL relative to regional geology and adjacent waste disposal units⁶.

In general, the ISL is located over an alluvial plain, incised within a limestone bedrock formation. These alluvial deposits vary in thickness and exceed 100 feet at some locations. The current interpretation of the ISL relative to underlying and surrounding geology is that of a surface or "area" fill. Based on this interpretation, waste materials were placed directly on alluvial deposits (or mine spoil) with no significant excavation below prevailing ground surface.

Figure 5-14 presented in the OU-1 RI Addendum (Appendix C) indicates the base of ISL refuse rests in the range of 430 to 460 feet (site datum). As a means to further refine base grade, various borings advanced either within or adjacent to the ISL were also examined to determine ISL base grade. Borings noting waste content and relevant elevation data are summarized in Table 1. Borings associated with the ISL that were reviewed and associated well installation logs (as applicable) are provided in Appendix B.

TABLE 1 ESTIMATED BASE OF WASTE

Boring ID	Ground Surface Elevation (fmsl)	Depth to Base of Waste	Estimated Base of Waste	Comments
PZ-205AS	454.3	28	426.3	Waste
PZ-107SS	462.6	28	434.6	Waste
LR-105	484.2	36	448.2	Waste
LR-103	460.1	33	427.1	Decayed Vegetation
LR-102	512.0	76	436	Waste
LR-101	500.2	54.7	445.5	Waste
LR-100	467.2	27	440.2	Waste

⁶ Remedial Investigation Addendum, West Lake Landfill, Operable Unit 1, Engineering Management Support, Inc., January 25, 2018.

Based on this boring data, an approximate base of waste may be established at elevation 425 fmsl. Correlating this boring data to normal water surface elevations recorded for the Levee District canal (433.0 per Earth City Levee District datum), the lower 8 to 10 feet of waste within the ISL could potentially be saturated. If this condition does occur, it may retard to some extent, both gas generation and migration within the lower portion of the waste column.

2.9 Discussion of Site Construction Details Including the Type and Characteristics of the Liner (if any), Type and Characteristics of Final Cover, and an Evaluation of Existing Cover Conditions.

No bottom or sidewall liners are known to have been placed within the ISL. The cover system placed following cessation of waste receipt appears to be a general soil or clay cap and was not certified. Cap thickness and engineering properties are currently under evaluation in accordance with the Remedial Design Work Plan (RDWP) and this evaluation is anticipated to be complete in the third quarter of 2020. Should existing cap characteristics be altered during RD or RA activities, impacts to potential gas migration will be reevaluated at that time.

2.10 Description of any Existing and Operating Gas Extraction or Gas Venting System.

No existing gas collection or venting system is present at the ISL. As previously indicated, an extensive active gas collection system is operating at the adjacent Bridgeton Landfill. The impact of the adjacent gas collection system on migration patterns within the ISL has not been defined. However as the potential gas migration monitoring zone is on the western perimeter of the ISL, minimal impact from the Bridgeton Landfill active gas collection system is expected to occur.

2.11 Description of Any Existing Explosive Gas Monitoring System and an Evaluation of its Effectiveness.

No existing monitoring system is in operation at the ISL. A comprehensive monitoring program is active at the neighboring Bridgeton Landfill. To date, this Bridgeton Landfill EGMP has been

deemed effective at detecting gas migration from the Bridgeton Landfill, and mitigating off-site impacts to occupied structures or associated properties.

2.12 Review of Explosive Gas Generation Potential.

In general, prior investigation of the Site concluded that gas generation potential is "low" due to the relative age of refuse as well as "closed" conditions. As indicated in Section 5.3 and 12.2 of the ROD"

"Landfill gas characterization of the Inactive Sanitary Landfill was accomplished using various measurement techniques. Air monitoring of the breathing zone conducted during 49 borings did not show appreciable impacts from landfill gas. Active gas venting was not observed. Direct measurements of landfill gas were made along the crest of the landfill. Measurements along the western perimeter were also taken. Sporadic impacts from combustible gas emissions and volatile organic compounds (VOCs) were observed."

"Landfill gas characterization of the Inactive Sanitary Landfill indicated the sporadic presence of decomposition gases and organic vapors. Typically, gas generation in municipal solid waste increases for the first five or six years after placement in the landfill and then declines thereafter. Because the landfill has been inactive for 30 years, decomposition gas generation is relatively low and expected to decline. However, even at low generation rates, placement of the landfill cover creates the potential for gases to be trapped and accumulate under the cover. To prevent pressure build up under the landfill cover and/or lateral migration, gas control systems may be required. Gas control measures may involve passive venting or active collection. The need for and nature of gas control measures will be evaluated and defined as part of the RD."

(Refer to Sections 5.3, 9.2, 12.2 and 13.2 of the ROD for additional discussion on gas generation assessments conducted during prior Site investigations.)

Based on the results of these prior investigations as well as ongoing investigations at the ISL and adjacent sites, data collected to date suggest that gas generation potential remains "low".

2.13 Review and Summary of Historical Records Pertaining to Explosive Gas Investigations.

As indicated in the ROD, investigation of explosive gas was generally related to, or coordinated with various intrusive investigations conducted for the purposes of initial site characterization. As

indicated in Section 2.12, limited gas generation (and therefore limited gas migration) potential was inferred through observation of both surface and subsurface Site conditions. Refer to Sections 5.3, 9.2, 12.2 and 13.2 of the ROD for additional information on these historical investigations.

2.14 Discussion of the Latest Explosive Gas Investigation for this Site.

As indicated in the ROD, the OU-2 RI was conducted to characterize affected media associated with the CDL, Bridgeton Landfill and the ISL. The RI included studies of the physical and biological characteristics, hydrogeologic characteristics, sources of contamination, surface and sediment quality, and air quality. Source characterization activities conducted for the ISL included landfill gas and leachate characterization. The findings of this characterization related to ISL landfill gas are briefly summarized below.

The landfill gas characterization of the ISL was accomplished using various measurement techniques. Air monitoring of the worker breathing zones conducted during advancement of 49 borings did not show appreciable impacts from landfill gas. Active gas venting was not observed. Direct measurements of landfill gas were made along the crest of the landfill. Measurements along the western perimeter were also taken. Sporadic impacts from combustible gas emissions and volatile organic compounds (VOCs) were observed.

In addition to findings documented during the RI, a site reconnaissance was conducted in March 2020 by CEC personnel and various site representatives. This reconnaissance included a walking tour of the landfill cap, site perimeter and various potential gas venting locations such as surface water ditches, cap transition areas and the entire western perimeter of the landfill. During this activity, no observed evidence of surficial gas migration was recorded which is consistent with findings of the RI conducted approximately 15 years prior.

2.15 Proposed Explosive Gas Monitoring System

2.15.1 Proposed Permanent Monitor and/or Punch Bar Station Locations, Depths, Screen Intervals, and Identification Designations.

The proposed permanent monitor system is illustrated on Figure 2. The system includes six dedicated gas monitoring wells, advanced to elevation 425 (fmsl) which is equivalent to the maximum estimated depth of the base of waste within the ISL. Should ongoing field investigations determine an alternate estimated base of waste, installation of supplemental wells or screened intervals may be evaluated at that time.

As the ISL is bounded by waste disposal facilities on the south, east and northern perimeters, only the western and southwestern perimeter is currently identified for permanent gas monitor placement at this time. Based on monitoring results obtained in these locations, the need for additional on-site or off-site monitoring wells will be evaluated as a component of required contingency monitoring plans (see Section 2.18).

The proposed gas monitoring wells are spaced at a maximum distance of 500 feet. Well depth, based on the ground surface elevations (approximate elevation is 450 fmsl) adjacent to the western perimeter of the ISL is approximately 25 feet.

Due to the expected heterogeneity of alluvial deposits within the proposed monitoring zone, each well will be screened continuously from 5 feet below ground surface to elevation 425 fmsl. The upper 5 feet will consist of a well bore seal and concrete anchor for well protective casings.

In consideration of the importance of groundwater levels relative to potential gas migration, each well will be fitted with a slip cap, thereby facilitating routine water level measurements. Each slip cap is also configured with a quick connect type fitting, thereby allowing measurement of well gas pressures and gas composition in a "sealed" configuration. The order of data collection will be of some level of importance given this well configuration and will be discussed in greater detail in Section 2.17.

2.15.2 Proposed Punch Bar or Temporary Monitors.

At this time, no punch bar monitoring stations or similar "temporary" monitoring facilities are proposed. Should gas migration be positively identified in the permanent well network, the addition of temporary monitoring stations will be evaluated at that time.

2.15.3 Proposed In-building Combustible Gas Alarms and Monitoring

At this time, only one occupied structure is located within 1,000 feet of the estimated limits of waste placement that does not currently utilize gas alarms. As this structure is located on the western side of the Earth City Levee Canal, no in-building alarms are currently installed or proposed for installation at this location. Should any positive detections of landfill gas above applicable thresholds in the permanent monitoring network be observed, evaluation of the need for in-building alarms will be conducted in accordance with contingency monitoring protocol set forth in Section 2.18.

2.16 Methods of Construction or Specifications for the Monitoring System.

Specifications related to permanent well installation are provided in Appendix D.

2.17 Explosive Gas Monitoring, Sampling and Reporting Procedures.

2.17.1 Monitoring Frequency.

In accordance with schedules associated with the OU-2 RDWP, the following monitoring schedule has been established for the permanent gas well network.

- Weekly January 8, 2021 through February 16, 2021;
- Monthly March 19, 2021 through July 4, 2021; and,
- Quarterly July 21, 2021 through end of the established post closure monitoring period.

2.17.2 Parameters to be Monitored Including Detailed Step-by-Step Instructions of the Proper Procedures to be Utilized in Conducting Monitoring.

The following parameters shall be monitored at all permanent and temporary monitoring locations, as noted, in the following order:

- Gas pressure in the permanent monitoring well.
- Initial combustible gas concentration in percent methane by volume (the monitoring well should not be vented prior to measuring the concentration of combustible gas).
- Water level in the permanent well.
- Ambient barometric pressure.
- Ambient air temperature.
- Observed weather conditions (sunny, overcast, recent precipitation, snow cover, etc.).
- Observations related to potential gas generation (odors, distressed vegetation, etc.).

Note: The monitoring equipment shall have a detection limit below twenty-five percent of the lower explosive limit. For the purposes of this EGMP "initial" means immediately after the gas pressure measurement so as not to inadvertently vent the monitor.

2.17.3 Data Reporting.

Results of this monitoring shall be transmitted to U.S. EPA at least quarterly within the framework of CERCLA monthly status/progress reports. MDNR will be provided copies via electronic submission. Both U.S. EPA and MDNR monitoring reports will be provided in a format and manner as prescribed by MDNR per current data reporting procedures.

2.18 Contingency Procedures.

2.18.1 Relevant Contingency Thresholds.

The established threshold for implementation of contingency procedures are established as follows. Note that thresholds apply to current conditions at the site, and also extend to future

conditions including the installation of any buildings, enclosures or similar potentially occupied structures that may be required as a component of the RA activities:

- Twenty-five percent (25%) of the lower explosive limit (LEL) or one and one quarter percent (1.25%) by volume for methane in buildings on the Bridgeton Landfill property (if located in the future); and
- Fifty percent (50%) of the LEL or two and one-half percent (2.5%) by volume for methane in the soil at the property boundary of the ISL.

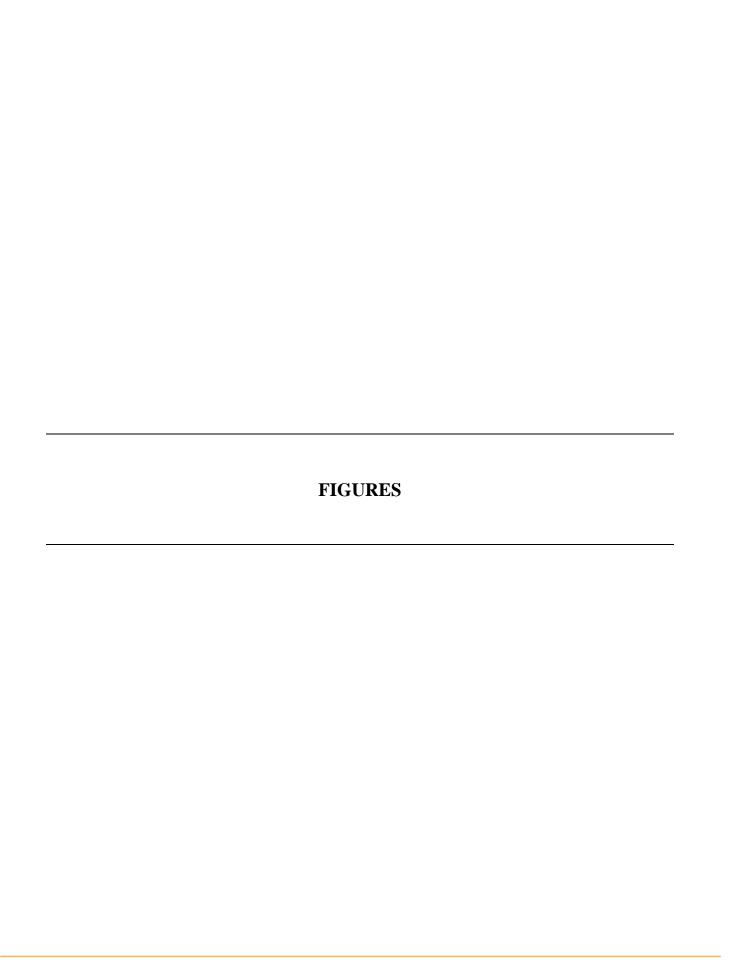
Contingency procedures will consist of the following:

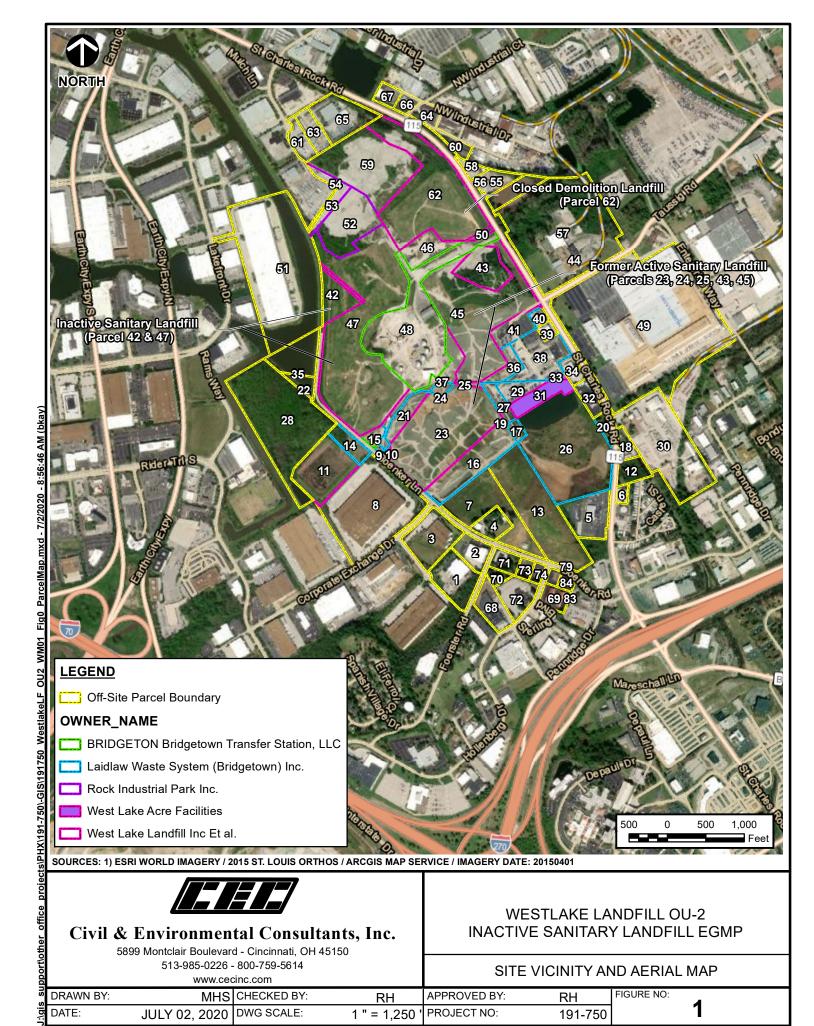
- If methane gas levels exceeding the limits specified in this EGMP, Bridgeton Landfill, LLC shall:
 - Immediately evaluate the potential for methane accumulation in on-site and off-site buildings;
 - o Immediately evaluate measures to reduce methane concentrations at monitored property boundaries to below compliance levels;
 - o Notify U.S. EPA and MDNR and immediately take all necessary steps to ensure protection of public health and safety including;
 - Within 7 days of detection, submit to U.S. EPA and MDNR a report describing the steps taken to protect public health and safety;
 - Within 60 days of detection, submit to U.S. EPA and MDNR for approval a remediation plan designed by a professional engineer for the methane gas releases;
 - Remediation plans shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon departmental approval; and
 - U.S. EPA or MDNR may establish alternative schedules reports and remediation plans for demonstrating compliance per 10 CSR 80-3.010(14)(E).
 - O When results of monitoring in <u>on-site or off-site structures</u> indicate levels in excess of those specified, immediate and appropriate action shall be taken to mitigate the effects of landfill gas accumulation in those structures until a permanent remediation is completed. Actions which must be undertaken include:
 - Notification of the fire department or other appropriate local public safety authorities. These include:
 - o Bridgeton Fire and Police Department 911
 - o Missouri Emergency Response Unit (573) 634-2436

- o MDNR Solid Waste Management Program (573) 751-5401
- o St. Louis County Department of Public Health (314) 615-4116
- Notification of adjacent property owners and/or occupants;
- Ventilation of any confined spaces that may trap decomposition gases or the installation of alarm systems in any confined spaces that may trap decomposition gases; and
- Establishment of a temporary methane monitoring program in affected structures.

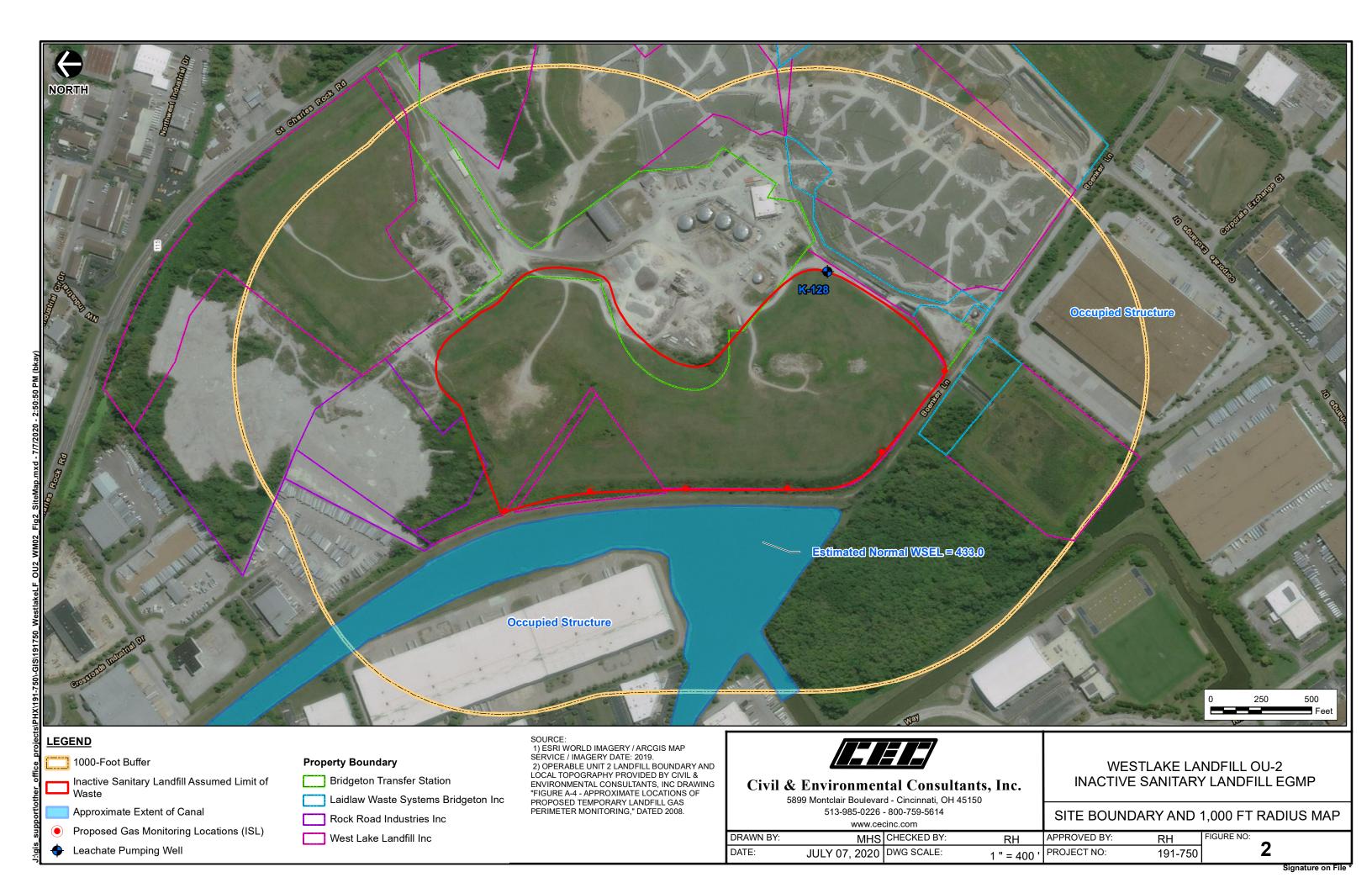
2.18.2 Contingency Monitoring

Contingency monitoring shall continue at no less than a weekly frequency until observation of four consecutive monitoring events indicating compliance with applicable gas thresholds. These four consecutive events shall be undertaken over a period of not less than two weeks.

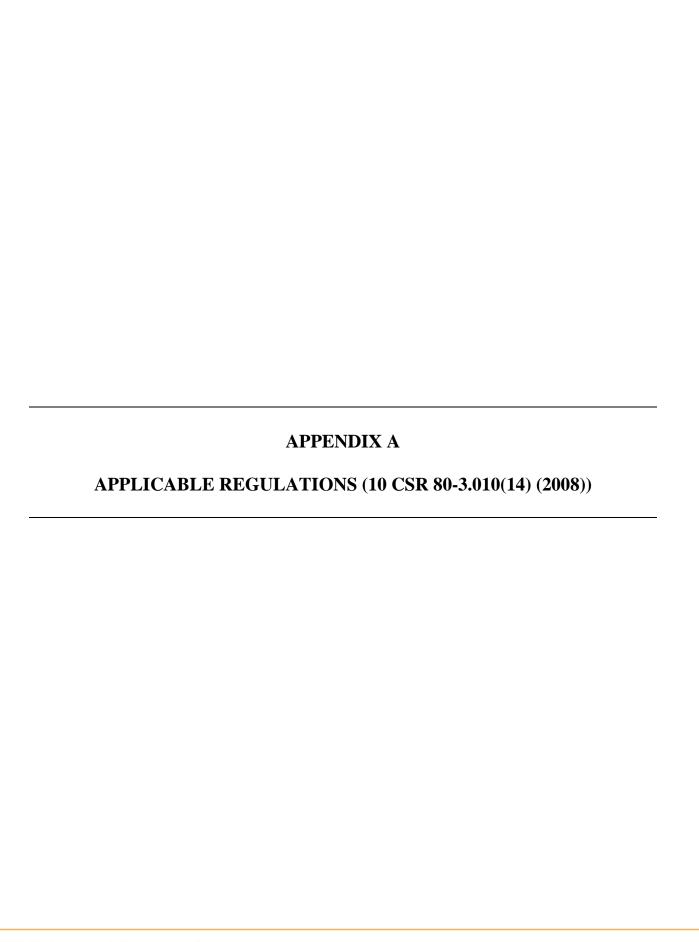




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obtained from the local pollution control agency. The operating procedures and location for burning practices shall be submitted to the department for review and written approval. Burning at the sanitary landfill shall be conducted in accordance with Chapter 643, RSMo, the corresponding rules, the terms conditions, or both, of the plans, permit, or both, and all local requirements.

(14) Gas Control.

- (A) Requirement. Decomposition gases generated within the sanitary landfill shall be controlled on-site, as necessary, to avoid posing a hazard to the environment or to public health and the safety of occupants of adjacent property
 - (B) Satisfactory Compliance—Design.
- 1. Plans shall contain a monitoring program capable of detecting decomposition gas migration.
- A. The monitoring program must specify the type of monitoring and be based on—
 - (I) Soil conditions;
- (II) The hydrogeologic and topographic conditions surrounding the facility; and
- (III) The location of facility structures, property boundaries, and off-site features.
- B. The monitoring program described in the plans must include:
- (I) A written description of the monitoring system, including spacing of monitoring locations and frequency of monitoring:
- (II) The results of any gas assessment that has been performed;
- (III) The location of all gas monitoring wells shown on a plan sheet;
- (IV) A drawing detailing the typical gas monitoring well design;
- (V) The design depths and bottom elevations of the gas monitoring wells; and
- (VI) Boring logs that support the design gas monitoring well depths.
- C. The gas monitoring specified in the plans shall be performed at gas monitoring wells. The monitoring program shall specify how buildings on the landfill property are to be monitored. Gas monitoring wells shall be designed to monitor the unsaturated soil and rock down to an elevation equal to the bottom elevation of the landfill. Gas monitoring wells shall be placed between the landfill and off-site buildings and other features that may be harmed by landfill gas or may easily transmit gas from the landfill. Gas monitoring well locations at the property boundary shall not be more than five hundred feet (500') apart unless the permittee can

show that the potential for gas migration is low

- Plans shall assess the need for gas control and indicate the location and design of any vents, barriers or other control measure to be provided.
- A. The gas control system shall be constructed of materials that are chemically resistant to the solid wastes managed in the sanitary landfill and the gas expected to be generated. These materials shall be specified in the engineering report and the choice of materials justified.
- B. The gas control system shall be constructed of materials that are of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying solid wastes, cover and by any equipment used at the sanitary landfill. Overburden pressure calculations, material specifications and system installation procedures shall be included in the engineering report.
- C. Maintenance and repair options shall be considered in the design and specified in the engineering report.
- D. All applicable permits and approvals necessary to comply with the requirements of the Air Conservation Law and rules promulgated shall be obtained from the department.
- E. The plan shall estimate the maximum anticipated rate of gas generation at the disposal area and the length of time over which it is anticipated to be generated. The method by which these calculations are arrived at shall also be included.
 - (C) Satisfactory Compliance—Operations.
- 1. Decomposition gases shall not be allowed to migrate laterally from the sanitary landfill to endanger public health and safety or to pose a hazard to the environment. They shall be controlled on-site, flared or vented to the atmosphere directly through the cover, cut-off trenches or ventilation systems in a way that they do not accumulate in explosive or toxic concentrations, especially within structures. (Information on the limits of flammability of gases is available in such references as the *Handbook of Chemistry and Physics*, 68th ed. Cleveland, Chemical Rubber Publishing Co., 1987.)
- 2. Decomposition gases shall not be allowed to concentrate above the following levels:
- A. Twenty-five percent (25%) of the lower explosive limit (LEL) or one and onequarter percent (1.25%) by volume for methane in buildings on the sanitary landfill property; and
- B. Fifty percent (50%) of the LEL or two and one-half percent (2.5%) by volume

for methane in the soil at the property boundary of the sanitary landfill.

- 3. For purposes of this section, lower explosive limit (LEL) means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at twenty-five degrees Celsius (25°C) and atmospheric pressure.
- 4. Owners/operators of all sanitary landfills shall implement a methane monitoring program capable of detecting decomposition gas migration in the most likely zone(s) of migration, to ensure that the standards of paragraph (14)(C)2. of this rule are met. Methane monitoring shall be conducted at least quarterly with equipment warranted by the manufacturer to detect explosive gases under the conditions the equipment is to be used. Facilities shall submit the results of this methane monitoring to the department at least quarterly. The electronic submission of methane monitoring data is required. This submission shall be in a format and manner as prescribed by the department.
- 5. If methane gas levels exceeding the limits specified in paragraph (14)(C)2. of this rule are detected, the owner/operator shall—
- A. Notify the department and immediately take all necessary steps to ensure protection of public health and safety which include:
- (I) When results of monitoring in on-site or off-site structures indicate levels in excess of those specified, the operator shall take appropriate action to mitigate the effects of landfill gas accumulation in those structures until a permanent remediation is completed. Actions which must be undertaken include:
- (a) Notification of the fire department or other appropriate local public safety authorities;
- (b) Notification of adjacent property owners and/or occupants;
- (c) Ventilation of any confined spaces that may trap decomposition gases or the installation of alarm systems in any confined spaces that may trap decomposition gases; and
- (d) Establishment of a temporary methane monitoring program in affected structures.
- B. Within seven (7) days of detection, submit to the department a report describing the steps taken to protect public health and safety;
- C. Within sixty (60) days of detection, submit to the department for approval a remediation plan designed by a professional engineer for the methane gas releases. A gas control system shall be designed to—

CSR

- (I) Prevent methane accumulation in on-site and off-site buildings;
- (II) Reduce methane concentrations at monitored property boundaries to below compliance levels; and
- (III) Reduce methane concentrations off-site to below compliance levels;
- D. Landfill gas corrective action plans shall describe the nature and extent of the problem and the proposed remedy. The plan shall be implemented upon departmental approval; and
- E. The department may establish alternative schedules for demonstrating compliance with subparagraphs (14)(C)5.B. and C. of this rule.
- The sanitary landfill shall operate in compliance with all applicable requirements of Chapter 643, RSMo and corresponding rules.

(15) Vectors.

- (A) Requirements. Conditions shall be maintained that are unfavorable for the harboring, feeding and breeding of vectors.
- (B) Satisfactory Compliance—Design. Plans shall include contingency programs for vector control and the operator shall be prepared at all times to implement those procedures.
- (C) Satisfactory Compliance—Operations. Vector control contingency programs shall be implemented when necessary to prevent or rectify vector problems.

(16) Aesthetics.

- (A) Requirement. The sanitary landfill shall be designed and operated at all times in an aesthetically acceptable manner.
- (B) Satisfactory Compliance—Design. Plans shall include an effective litter control facility and operating program.
 - (C) Satisfactory Compliance—Operations.
- 1. Portable litter fences or other devices shall be used in the immediate vicinity of the working face and at other appropriate locations to control blowing litter. At the end of each operating day, or more often as required, litter shall be removed from the fences and the ground and incorporated into the cell being used. Alternatively, the litter may be containerized for disposal on the next operating day.
- Solid wastes that are easily moved by wind shall be covered, as necessary, to prevent becoming airborne and scattered.
- 3. On-site vegetation should be cleared only as necessary. Natural windbreaks, such as green belts, should be maintained where they will improve the appearance and operation of the sanitary landfill.

4. Salvage operations shall be conducted in such a manner as to not detract from the appearance of the sanitary landfill. Salvaged materials shall be removed from the sanitary landfill daily or stored in aesthetically acceptable containers or enclosures.

(17) Cover.

- (A) Requirement. Cover shall be applied to minimize fire hazards, infiltration of precipitation, odors and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance.
- (B) Satisfactory Compliance—Design. The owner/operator shall prepare a written closure plan that describes the steps necessary to close all sanitary landfill phases at any point during the active life of the sanitary landfill in accordance with the requirements of 10 CSR 80-2.030(4)(A). In addition, the final cover requirements specified in the closure and post-closure plans shall specify—
- 1. Cover sources, quantities and soil classification (Unified Soil Classification System or United States Department of Agriculture classification system);
- 2. The capability of the cover to perform the functions listed in subsection (17)(A) of this rule;
- 3. Surface grades and side slopes needed to promote maximum runoff, without excessive erosion, to minimize infiltration. Final side slopes shall not exceed twenty-five percent (25%) unless it has been demonstrated in a detailed slope stability analysis approved by the department that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill.
- 4. Procedures to establish and maintain vegetative growth to combat erosion and improve appearance of idle and completed areas. Procedures shall include seeding rate, fertilizer rate, soil conditioning rate and provisions for mulching;
- 5. Procedures to maintain a cover integrity, for example, regrading and recovering;
- 6. Methods for borrow areas to be reclaimed so as to restore aesthetic qualities and prevent excessive erosion;
- 7. The final slope of the top of the sanitary landfill shall have a minimum slope of five percent (5%); and
- 8. Shear failure analyses shall be included where intermediate or final slopes exceed twenty-five percent (25%). However, the department will waive the analysis for slopes of twenty-five percent (25%) or less, except in seismic impact zones.
 - (C) Satisfactory Compliance—Operations.

- 1. Cover shall be applied by the end of each operating day regardless of weather; sources of cover, therefore, shall be accessible on all operating days. The thickness of the compacted cover shall not be less than six inches (6"). Sanitary landfills operating twenty-four (24) hours per day shall incorporate all solid waste into one (1) or more cells at least every twenty-four (24) hours. Where a liner and leachate collection system are in place, an alternative daily cover may be approved by the department on a site-specific basis, if the owner/operator demonstrates that the alternative material controls run-on. runoff, disease vectors, fires, odors, blowing litter and scavenging without presenting a threat to human health and the environment.
- 2. Cover shall be increased to a total thickness of at least one foot (1') of compacted cover on filled areas of the sanitary landfill which are idle for more than sixty (60) days.
- 3. No active, intermediate or final slope shall exceed thirty-three and one-third percent (33 1/3%).
- 4. As each phase of the sanitary landfill is completed, a final cover system shall be installed at portions of—
- A. Existing sanitary landfills without composite liners. This final cover shall consist of at least two feet (2') of compacted clay with a coefficient of permeability of 1×10^{-5} cm/sec or less and overlaid by at least one foot (1') of soil capable of sustaining vegetative growth;
- B. Sanitary landfills with composite liners. This final cover shall consist of component layers, in order from top to bottom, as follows:
- (I) Two feet (2') of soil capable of sustaining vegetative growth;
 - (II) A drainage layer;
- (III) A geomembrane liner at least as thick as the geomembrane liner described in subparagraph (10)(B)1.G.;
- (IV) One foot (1') of compacted clay with a coefficient of permeability of 1 \times $10^{\text{-5}}$ cm/sec or less; and
- C. The geomembrane liner shall be in intimate contact with the underlying compacted clay.
- The installation of the final cover systems shall include provisions for slope stability.
- 6. The department may approve the use of an alternative final cover system provided that the owner/operator can demonstrate to the department that the alternative design will be at least equivalent to the final cover system described in paragraph (17)(C)3. of this rule.

MISSOURI DEPARTMENT OF NATURAL RESOURCES

Sampling of Landfill Gas Monitoring Wells

Technical Bulletin 9/1999

Division of Environmental Quality Solid Waste Management Program

Overview

This document was prepared by the Missouri Department of Natural Resources' Solid Waste Management Program (SWMP) to provide guidance regarding the quarterly sampling of gas monitoring wells as required by 10 CSR 80-3.010(14) and 10 CSR 80-4.010(14). This guidance applies to all landfills that monitor for methane migration by means of gas monitoring wells. Sampling results must be submitted at least quarterly to SWMP in an electronic format.

Sampling Equipment

Proper selection of sampling equipment is critical in obtaining true soil gas concentrations. Explosimeter-type instruments are not appropriate for measuring methane in gas monitoring wells, because the amount of oxygen which is present in the well may not be sufficient for the sample to "burn." These instruments will typically give false low readings when high concentrations of methane are present.

It is recommended that instruments used to sample gas monitoring wells have an automatic pump that has the ability to withdraw enough volume to bring a fresh sample of soil gas into the well. It is also beneficial that the instrument reads both oxygen and methane concentrations. Some instruments have the ability to read barometric pressure, which is also desirable.

Sampling Procedures

Step 1 - Make sure the instrument is properly calibrated. Prepare the instrument for sampling by allowing it to properly warm up as directed by the manufacturer.

- Step 2 Connect the instrument to the well head and begin collecting a sample.
- Step 3 Continue collecting the sample until the reading stabilizes. A stable reading is one that does not vary more than 0.5 percent by volume on the instrument's scale.
- Step 4 A proper reading should have 2 percent oxygen by volume or less. If levels of oxygen are higher, it may indicate that air is being drawn into the system giving a false reading of the true soil gas concentrations. Possible explanations for this problem are:
- A. The gas monitoring well seal has failed;
- B. Well head connectors are leaking; or
- C. A connection at the instrument is leaking.

When the problem is eliminated repeat Steps 1-3. If the problem cannot be corrected, record those values and make sure that the problem is well documented in the report sent to the department.

Recycled Paper



Step 5 - Record the stabilized reading including the oxygen concentration and barometric pressure, if available.

Obtaining true soil gas concentrations from gas monitoring wells is dependent upon using a consistent proven method. If you have problems using the sampling procedures described, you should contact the department as soon as possible.

Sampling Times

Sampling times are almost as important as the procedure used to collect the sample. Proper monitoring of the site should include sampling at those times when landfill gas is most likely to migrate. Scientific evidence indicates that weather and soil conditions influence when gas will migrate. For these reasons sampling should be considered when:

- A. Barometric pressure is low and soils are saturated; or
- B. When snow cover is just beginning to melt; or
- C. The ground is frozen or ice covered.

Records

The Solid Waste Management Regulations require that reports on data collected from wells be submitted to SWMP at least quarterly. The SWMP recommends that gas monitoring be conducted during the months of February, May, August and November and that the results be submitted within 30 days of sampling. The data must be submitted in electronic form. The results submitted should contain:

- 1. The location of monitoring points.
- 2. Sample results obtained should include the date the sampling was performed and the barometric pressure, if available. Methane measurements may be given as a percentage of the total air volume or as a percentage of the Lower Explosive Limit (LEL). The following formula can be used to convert a percentage of LEL into a percentage methane by volume:
 - % Methane (by volume) = LEL (%) \div 20
- 3. The amount of time a well is pumped before a stabilized methane reading is taken.
- 4. The percent volume of O₂ (if the instrument used is capable of measuring).

The form attached to the end of this bulletin may be used to record the information required by the department.

Conclusions

Missouri has stringent regulations governing landfill gas migration. The department prefers to address the issue of migrating gases before they present a threat to public safety or the environment.

Migrating gases detected above allowable limits at property boundaries do not necessarily mean that there is an immediate threat to public safety. It does mean that there is a potential problem that must be addressed. In order to address such a problem, a permit modification to install a gas collection system may be necessary.

References

Landtec Landfill Control Technologies, *Landfill Gas System Engineering Design: A Practical Approach*, course notes from Landfill Gas System Engineering Design Seminar, 1994.

Missouri Department of Natural Resources, Flood Grant Team, *Landfill Gas Monitoring Protocol*, available on the Solid Waste Management Program's web site.

For more information call or write:
Missouri Department of Natural Resources
Solid Waste Management Program
P.O. Box 176, Jefferson City, MO 65102-0176
1-800-361-4827 or (573) 751-5401 office
(573) 526-3902 fax
(http://www.dnr.state.mo.us/deq/swmp) Program Home Page

○ ■	Solid Waste Management Program Ouarterly Gas Monitoring Report
A	Quarterly Gas Monitoring Report

Facility:	Permit Number:					
Name of Sample Collector:						
Pate of Observations:						
Type of Detection Instrument Used on Wells:						
- in Buildings:						
Pump Rate of Instrument Used to Monitor Wells:						
Barometric Pressure: Weather Conditions:						

Instructions: Under "Location or Well Designation" identify the monitoring wells or describe the location for other tests (e.g., inside buildings). A drawing showing the location of test can be attached. Report methane readings in either % methane by volume, as % LEL (Lower Explosive Limit) or both. A reading in percent methane by volume can be converted to % LEL as follows:

% methane by volume = % LEL \div 20

Location or Well Designation	% LEL	% CH4 by volume	% O2	% CO2	Time pumped (for wells) in seconds	Comments

Location or Well Designation	% LEL	% CH4 by volume	% O2	% CO2	Time pumped (for wells) in seconds	Comments

If your facility has more gas monitoring locations than there is room on this form, please attach additional sheets listing the same information as contained on this form.

I hereby certify that the information on this form was collected by me and is correct to the best of my knowledge and belief.

SIGNA	TURF

Submit to: Missouri Department of Natural Resources

Solid Waste Management Program

P.O. Box 176

Jefferson City, MO 65102-0176

Please submit electronic copies to the above address or via electronic mail at:

swmp@mail.dnr.state.mo.us



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Well No. LR-100

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PIEZOMETER CONSTRUCTION SUMMARY

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MISSOURI DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGY AND LAND SURVEY

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	ORING WELL IN RACTOR'S NAMI	N C	Ca, INC.					PERMIT NUMBER O			PIZSS WPM						
DRILLING CONTRACTOR'S NAME LAYNE WESTERN													ıΤ				
WELL CONSTRUCTION INFORMATION																	
TYPE OF WELL	☐ MONITORING WELL ☐ PIEZOMETER ☐ HAZARDOL FOTEN ☐ HAZARDOL FOTEN ☐ LANDFILL											NLL THAT APPLY)					
PRO-	OTHER			L.U.S.T.						V.O.C. OTHER		ON			ROLEUM PRODUCT		
TECTIVE CASING DETAILS (IF USED)	5 =	CASING SDR # DEPTH OF DRILL HOLE IN					SECHANICAL WELDED STEEL					☐ THERMO PLASTIC LOCKING CAP? ☐ FLUORO POLYMER ☑ YES ☐ NO					
(IF USEU)	CAP VENTED NO	CASIF	MATERIAL	MATERIAL DEPTH FROM TO THE BOTTO CASING GROU			IRFAC		TYPE			DESCRIBE HOW THE FLUSH MOUNT WAS					
	WEEP HOLE?	GROU	ILS E CONCE				UT SEAL SURFAC			E GROUND			CONSTRUCTED				
☐ YES ☐ NO ☐ OTHER , CENTRALIZER USED ☑ NO							FT	TION	ì	MOUNT	_						
ON RISER	YES		MATE		LESS STE	EL 🗆 d	THER .		_ -								
AISER PIPE	LENGTH	Ð	HAMETER OF ISER PIPE				ETER OF JOINTS			(X) THREADE							
DETAILS	22.9	22.9 FT.		2 IN SCH80			8/4 IN □ OTH						STEEL FLUGRO POLYM				
ANNULAI SEAL	BENTONITE S	YRAUJ	BAGS	CEMENT/BENTONITE SLURR BAGS OF CEMENT USED			BENTONITE BENTO			NITE			LENGTH OF SEAL INSTALLED IN SEAL INSTALLED IN SOURCE ZONE				
JUAL	U NON SLURRY TYPE:	BENTO	* BEI	% BENTONITE USED													
PRIMARY	E SAME	SAND MANUFACTURED NATURAL TYPE		LENGTH OF FILTER PACK		METHOD OF INSTALLATION			Information in this column to be supplied in the Feet		Į FE	ET	FORMATION			EU ZUNE	
PACK	NATURAL TYPE				80 FT.		HISA POUR			from Surface SL				DESCRIPTION			
FILTER PACK	MANUFACTU			GRAIN SIZE LENGTH OF FIL PACK		INSTAL	LATION		Depth to bottom of Profective Casing Seat:		3.,	0-6 Cla		laye	ley silt		
WELL SCREEN	LENGTH OF SCREE	5 FT.		SLOT SIZE V		☑ PL	ASTIC	C				6-25.5		5 T	Trash		
SUMP				IAMETER OF SUMP MAT			STEEL FLUORO POLYMER			Depth to Base of Annular Seat:		D.,					
DETAILS			1		☐ PVC ☐ FLUORO ☐ OTHER	D POLY			Depth to Base of Bentonite Seal:		17.	ام					
BACK FILL	WAS THE WELL BACK FILLED? YES NO		MATERIAL USED	1			OTH OF BACK FILLED E HOLE			Depth to Top of Primary Filter Pack: 18		اً و					
TATIC WATER LEVEL FEET FROM MULTIPLE CA				SED WELLS						Top of the	21.						
ATE OF ST	MEASU ATIC WATER LEVEL	CONSTRUCTION	JN DETAILS	IVOR AN	HOW IB BI	ING WELL ZE OF ALL	SCI STIL	icreen: 21.0			25.5-28 Cky						
EASURING POINT FOR STATIC WATER LEVEL IS DRILLING EQUIPING TOP OF RISER PIPE					METERS, AND GROUT USED.			I. 3. Δ.	Depth to Battom of the Screen:			o					
] отнея	F_MEASURING POINT			E			Total Depth: Zb.D										
	464.12	REVERS ROTARY		OTHER				DATE WELL DRILLING WAS COMPLETED 10-04-95 STRUCTED IN ACCORDANCE WITH THE DEPARTMENT									
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	TENERAL OF C	n ine co	NSTRUCT	IONO	JF M	ONLIOR	NG WEL	LS.	CCO	RDA	NCE WIT	H TH	E DEPA	RTMENT	
SIGNATURE PRIMARY CONTRACTOR/PERMIT DATE 11-15-45 TOWARD NAME II-15-45												5.46					
780-1415 (7		DIS	TRIBUTION: W	HITE/DIVISI			ITOR	ING WELL	CONTRAC	CTOR PI	NK/OV	VNER			11-11 (D)	- (3	

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINCOWNER MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, HOLLAN MO 65402 ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

₩ MCACTTO NAME

	4	AIDI			A A A A A A A A A A A A A A A A A A A		50	IL E	ORE	HC)LE	LOG		
SITE NAM	*************		******				DRALLING METIK	O:				BORNING I		
.t							4.25 inch I.)./8.25 inc	h (J.D. Hol	low Ste	em Auger)1	
1 .											***************************************	SHEET		Z Z
							SAMPLING METH	00:			········	NAME AND ADDRESS OF THE OWNER, WHEN	f ⁴	LAYNE-WESTERN
		L.A	AIDLA\	w/aus	RI-FS/MO		SPLIT SPOOM	***************************************		**************************************	***************************************		LING	ξij
1		\		LAKE L	ANDFILL		SHELBY TUB	: 3.0 inch	. O.D./2 13	/16 inc	n I.D. (SH		FINISH	岁
			LI L.N	.ABCC G			WATER LEVEL	DRY	51.0 FT.	*******		8:00	15:20	3
		,					TNAE	11:15	15:30			DATE	DATE	
	NORTHI						DATE	THE CONTRACTOR OF THE PARTY OF	10/10/95	***************************************		10/10/95		
DATUM		OMM SHALL SOMEONE	MANUAL PROPERTY.	3.41	ELEVATION 500.2		CASING DEPTH		55.0 FT.					DRILLING CONTR
ORALL RI	-	E 75		BEARING	NΛ	SU.	IRFACE CONDITIONS		***************************************		Marian and a second life			Ś
SAMPLE	***************************************			CANTO	13.54		***************************************		***************************************	***************************************	×	, · · · · · · · · · · · · · · · · · · ·		
SAMPLE	Piranae.	X T	T	1 :		-	***************************************	· · · · · · · · · · · · · · · · · · ·	***********	-T1	T			8
l lie	<u>z</u> :85	_		SAMPLER STABOL						7				3
DEPTH IN FEET	BLOW/ 6 N.	RECOVERY	SMESO	18	SAM	PLE	NUAMBER NO					REMA	aks.	区
	3	18	8] 💆	DESCRIP	TION	OF MATERIAL			SWENTER CE		1 AG249 W	u v ap	
\$m	88	E		Ì						8				
***************************************	<u> </u>	<u> </u>	<u></u>	<u> </u>	Attenuaries de la company de manter de families de la company de contraction de la company de company de compa				W. 7 St. 11 St. 12 St.			CANADA MARIO DA CARA DE LA PROPERTICION DE LA PROPE	Vota (1999) - 18 (1994) - 18 (1994) - 18 (1994)	
		0.1'	ШП		(0.0-1.0 ft.) Compact, brown (10YR 5/4), SIL	mode	erate yellowish			ST			***************************************	
3 4 5 5		C1020			(FILL)	۱۷ ر	ik, ary, (MC),	(4)	99.2) 1.		**************************************			
1	20 39	1.6°			(1.0-2.6 ft.) Crushed,	LIM	ESTONE Gravel							
	25	(80%) S:0,	ູ້	M	(GP), (FILL)					SP	目			
2	53	l		7						2				
		l	1111	7	(2.6-5.0 ft.) Compact,	oliv	/a orny	(4)	97.6) 2.	5				
3	14	1.14		H	(5Y 4/1), SILT, NR, dr	y, (1	ML), (FILL)							NGT
	4 8 10	1.1' 2.0' (55%)		M						SP	= 1			HARRINGTON
<u></u>	6	(33%)								3				
								(4	95.5) 4.		3			ď
= 5			Α,4		(4.7-12.4 Pt.) WASTE,	damp	p							
=	7	1.0° 2.0° (50%)	A A A A	M							=			
	6 25 50/3	(50%)	7 🗸							SP				
	00,0		7 7 7 7							4				æ
			7 7											
E 7	6	0.91	7								日日	0.0 ppm P	ID	GE9907
	6 7 11 5	0.9' 2.0' (45%)	70							SP	31			9907
= 8	5		ΔΔ	\Box						(3)	= 1			erend 1
-	1		7 7 7 7								31			
9	40	1.17	77	\vdash							31			
_	40 8 5 14	2.07 85520	7 7 7 7	M						q ₂	=			
- 10	14	1	ΔΔ		@ 10.0 ft, moist					(6)				
E			7 7]	e told i by moist						∃			
E 11	1		7 7 7 7				•						ļ	
	12 15	(85%) (65%)	∇											89
E	12 15 5 7	(65%)	7	N						SP			ļ	943-2848
12	ľ		Z V					(4)	87.8> 12.4					£ 5
9 = 10 = 11 = 12 = 13					(12.4-19.9 ft.) Compac- (5Y 4/1), SILT, with lit						_			94.
13	8				(ML), (FILL)								***************************************	'
	16 10									SP				<u>.</u>
E 14	iš									8				SOB NO:
=					@ 14.5 ft. wet									ğ
<u> </u>		<u> </u>	ШШ	L						لــــــــــــــــــــــــــــــــــــــ				

	Á						SO	IL E	BORE	EHO	LE	LOG		
SITE NAW		MALE PARTY OF THE		ABIE S'	rstems inc.	1	DROLLING METHIC	0:	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			BORNING		
							4.25 inch 1.1	0./8.25 inc	h 🗓.D. Ho	dlow Ste	m Auger] LR-1	01	
1												SHEET		_Z
							Sampling meth				·	2	OF ⁴	LAYNE-WESTERN
		LA	DLAV	//au2	RI-FS/MO		SPLIT SPOOM					-Į	LLING	ا الإ
		W	T23		ANDFILL		SHELBY TUB	: 3.0 inch	0.D./2 1	3/16 incl	n I.D. (SH)	START	FINISH TIME	빌
			BPCK	HDEE U	NII E	ļ	WATER LEVEL	DRY	51.0 FT.			8:00	15:20	Š
•							TWE	11:15	15:30	-		DATE	DATE	
	IDRTHI	NG: 10	16840	12.25			DATE CASING DEPTH	The state of the s	10/10/95	***************************************		1	10/10/95	n'
DATUM E	*******			3.41	ELEVATION 500.2			***************************************	55.0 FT	.) -/			A STREET STREET	l E
ANGLE		E 75	***********	BEARING	NΔ	SUF	REACE COMOTIONS	<u> </u>		<u>,</u>	***************************************			CONTR
SAMPLE	*****	·······		DEPRING	147		,	**************************************		************			<u> </u>	Ö
SPERTLE	L-A-motioner's	` Г Т	*****	TJ		<u></u>		CONTRACT		T		************		Ž
i iig	zi L	اڃا	1	SAMPLER STABOX						¥				ORILLING
Z S		RECOVERY	SMEGA	6		AN						REMA	rks	ä
OEPTH IN FEE (ELEVATION)	BEOW/ 8 %.	8	E		DESCRIP	TROM	OF MATERIAL							ļ
8	"			å						_ ["]				
particular distribution and an annual distributi	74	1, 7, 1	ПП	1 7	(12.4-19.9 ft.) Compac	·+ al	IVP OPAV							
	6 13 20	1.7' 2.0' (85%)		M	(5Y 4/1), SILT, with li	ttle	waste, damp,			SP				
16	50/5	1837.		M	(ML), (FILL)					(9)				8
				/\										711 TON
上 17											-31	0.0 ppm	PID	l l
Ę	22 18	5.0°		M							= 1			
- 18	18 16	(30%)								SP (10)				
E											31			HARRINGTON CHK'D BY
E 19											-=			, , ~
	5 8 8	0.91 2.01 (45%)		M						_				m m
E_20	26 10	(45X)	Щ	/	(19.9-51.5 ft.) WASTE,	dam		(4	180.3> 1					
			∇ ∇	4	(1)., 01.0 4.10.0,		۳			(11)	31			723/95
E 21			7 V	,						ļ				
	7	0.9′ 2.0′	7. 7 .	M	from 21.4-21.5 ft., lay	ver :	of olive arev							े र्व
= 22	50 25	(45%)	∐∐ 7		(5Y 4/1), SILT, with U					SP				1
Es de			Q 2	7						(2)	MATERIAL MAT			LOGGED
E_23			♥ ₹								***************************************	00	OID	9 2
4.3	29 18	1.4' 2.0' (70%)	7 V									0.0 ppm	⊾1⊓	
= 24	29 18 25 50/4	(70%)	$\coprod \prod$	M	from 23.5-24.0 ft., lo (5Y 4/1), \$ILT, with li	iyer ittle	of alive gray waste, wet, (4L)		SP				
44	1	•	Δ.		@ 24.0 ft, moist					13	=			
			\ \ \ \ \ \ \ \ \	ן ן							31			
E 25	27 19	0.51		M										
E _	38	(52%) (52%) (52%)	7 7 7 7							SP				1 1
26	38		7 7	7	@ 26.0 ft., wet					[4]				
	1		7 7 7 7								=			943-2848 101
27	8	0.81	7 V								目目	0.0 ppm	PID	13-
E	8 15 50/6	2.0° (40%)	V 7							SP	easpac			94.
			\trianslight \text{\alpha} \text{\alpha}							15	****			'
			7 7											
29	50/1	0.14	2 Q	4						SP	***************************************			JOB NO.:
	1307	2.0	7	7						(6)				8 6
		(3/2)	7 🗸	1										ز

	4	LAID	A)		A IV		SO		BOR	H(DLE		OG.		
SITE NA	****					***************************************	DROLLING METHO	Ю:					BORBNG N	· · · · ·	1
							4.25 inch 1.1	0./8.25 inc	h O.D. Ho	low St	em Augei	r	LR-10)1]
									· · · · · · · · · · · · · · · · · · ·	***************************************			SHEET		Z
							SAMPLING METH		***************************************	***************************************	**************		3 0	F 4	LAYNE-VESTERN
1					RI-FS/MO		SPLIT SPOOM				······································	-	DAHL	LING	Į ¥I
ļ		,		LAKE L ABLE L	.ANDFILL JNIT 2	ļ	SHELBY TUB		**************************************	3/16 inc	ch I.D. (S	(H)	STAKT	FINISH	ᄬ
							WATER LEVEL	DRY	51.0 FT.				TIME 8:00	15:20	[[]
					•		DATE	11:15	15:30				DATE	DATE	
DATIMA	NORTH!	ING:	106840	25.50	ELEVATION 500.2	- }	CASING DEPTH	A PROPERTY OF THE PARTY OF THE	10/10/95			1		10/10/95	
DATUM DRILL R		4E 7	CHARLES AND SECURITY OF	5,41	ETEANION 20015	Tell	REACE CONDITIONS		55.0 FT.				**************		CONTR
ANGLE	*************	**********	de la	BEARING	NA NA	201	e ACC COMBINATE) Wiking	******************	***************************************	A CONTRACTOR OF THE PARTY OF TH			F	Į Š
SAMPLE	HAMME	R	po		TAXABLE TAXABL	<u> </u>			***************************************	***************************************					1
DEPTH IN FEET (ELEVATION)	GLOW/ 8 IN. ON SAMPLER	RECOVERY	SARR	SAMPLER STABOL		AN	NUMBER NO OF WATERFAL	AND AND THE COMMENTS OF THE CO		SWALER TYPE			REMAR	XS	DRILLING
	50/5	0.20	2		(19.5-51.5 ft.) WASTE,	damı		7934 W. T.	**************************************	SP (18)		wi-	ods warr thdrawa orehole.		
32	50/5	610X)	7		,					SP 17	****				N C
33 34	9 23 10 16	1.5' 2.0' K75Z	7	M						SP (18)		0.0	ppm Pi	ם	B. HARRINGTON
35 = 35 = 36	9 11 17 17	(90%)	2 Q		from 35.3-35.7 ft, la (5Y 4/1), SILT, moist,	yer (ML)	of olive gray			SP (19)		8. Ra	11:00 in		*
37 38	9 38 29 17		7		@ 37.0 ft, wet					© 42		34	ppm PII X LEL, s	stop	LOGGED BY
39 40	42 45 36 17	ke2x)	7 ♥		€ 40.0 ft, moist					SP (21)	40000	dri	illing ter	nporarily	
41 = 42	11 11 18 20	K552)	7							SP 22					943-2848
43	12 18 40 50/1	(80%)	7 🗸							5° (3)	**************************************	6.1	ppm PII	D	10B NO.:

	4			ned klonemit k	L/A/BV YSTEMS INC.		SO		BOR	EH()LE	LOG		
SITE NAM	residence (mini	*******	MATERIAL PROPERTY CONTROL	ADIE 3	7 & 1 ERS & M.C.		DRALLING METHO	X):			-	BORING N	<i>i</i> 0.	
ď						ľ	4.25 inch 1.1	0.78.25 inc	h O.D. Ho	ollow St	em Aug <i>er</i>	LR-10)1	
1						I						SHEET		z
							SAMPLING METH	00:				4 0	₹ 4	IER
ļ		1.4	א אוווי	//nu2 i	RI-FS/MO		SPLIT SPOOM	∜ 3.0 inch	O.D./2 1	3/16 inc	h I.B. (SP)	DRN.	TING	LAYNE-VESTERN
			J TZJ/	AKE L	ANDFILL		SHELBY TUB	E: 3.0 inch	0.D./2 1	.3/16 inc	th I.D. (SH)		Finish	띻
			DPER	ABLE U	NI S	a	WATER LEVEL	DRY	51.0 FT.			TIME	TIME	LAY
							TRAE	11:15	15:30	ļ		8:00	15:20	
1	NORTHI	NG: 1	06840	2.25		ļ	DATE	10/10/95	10/10/9	**************************************	MM-104-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	DATE 10/10/95	DATE 10/10/95	
DATUM E	darentalista (mail		-	.41	ELEVATION 500.2		CASING DEPTH	35.0 FT.	55.0 FT			107,107, 27	107 107 73	
ORILL RX		E 75	**********	**************************************	\$ A	SUR	FACE COMOTIONS	S	54 141355554444444	***********************		n de andrese (Names (alban) (n) a bladden	**************************************	CONTR
ANGLE SAMPLE	*********		8	BEARING	NA 		-			***************************************	***************************************			
SMAPLE	T-COLDARS	· 							PHILIPPIAN COMMONIUM	- T		<u> </u>	**************************************	2
DEPTH NV FEET (ELEVATION)	BOW/ 6 M.	RECOVERY	SMBOL	SAMPLER STANGOL		AN	number o of material			SWAPE THE		REMAR	eks ·	DRILLING
***************************************	Isn/5		V V	K	(19.5-51.5 ft.) WASTE,		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		***************************************			Drill rods	·······································	
E	50/5	2.07	$\nabla \Delta$		CENT SEE FOR WHATE,	- Gunp					= 1	warm upo drawai fr	n with-	
46			7 7							SP		borehole.	On.	2
			2							2 4)	=			TIL TON
47	ļ.,		$\nabla \nabla$		from 47,0-48.0 ft, an									B. T
Ę	34 15	LU	7.7		rrom 47,0"40.0 ft, ar	ninoniu	. Gdor				3			1 <u></u> ! !
48	25 33	(90%)	7 V	V						SP				HARRINGTON HK'D BY
- 48			ΔΔ	/\						(25)				HARRIN
<u> </u>			$\Delta \Delta$											
- '-	12 11	5.01	ַסַל											m
= 50	14 16	(95%)	7 4	M						SP				
= "			ΔΔ	/\						[29]		Newsprint 1974-1976		95
E 51												0.3 ppm P 34% LEL	ID	723795
	5 13 55	2.0°	7 🗸					(4-	48.7) 5	1.5		Temporari drilling	ly stop	<u>``</u>
52	55 50/5	K100%>		M	(51.5-52.1 ft.) Compac (5Y 4/1), SILT, moist,			(4	48.1> 5	2.1 SP				
			4	\mathbb{N}	(52.1-54.7 ft.) Dense,	blac	k stained SIL7	Γ			M/COM#			LOGGED
53			\ <u> </u>		and mixed WASTE, sor burned), damp to moi			→ 1₹			31			1066 PATE
	29 25 6	1.6' 2.0' (80%)										0.0 ppm P	מו	
	6	(80%)	∇	M						SP				
54	``		V	/ \				<u>.</u> .	س . سر سر بر	. 8				
			ĽЩ		(54.7-57.0 ft.) Very	loose	, very light	(4-	45.5) 54	}./	= 1			
55	1	2.0°		\Box	gray (N8), very fine laminated lime, appear	ZAND	and thinly				31	Water lev		
20004	1	Z.U K100KX	٨	M	spoils, WR, wet, (FILL	.)	De Pille			SP		after per	netrating	
56	3		٨	Ä						29	***************************************	mine spoil:	5.	
E			٨					14.	43.2) 51	1 1				943-2848
57				l	End of Soil Borehole	Log	at 55.0 ft.	, T.			=			13-6
					At completion of dril	ling, k	oorehole				31			94. LR101
58					sealed to surface w grout.	ith c	ement/bentoni	te			**************************************			=
					-						=			;; <u>;;</u>
<u> </u>														MOB NO.:
											=			
			<u> </u>			···								



MISSOURI DEPARTMENT OF NATURAL RESOURCES

OFFICE USE		DATE RECEIVED	
REF. NO. 13:	1862		
ROUTE		P.W.S. NUMBER	CHECK NUMBER
STATE WELL NUM	BEA	TRANSMITTAL NO.	
CHECKED BY		CROSS REFERENCE NO	· · · · · · · · · · · · · · · · · · ·
APPROVED BY	DATE	ENTERED	

			_	STA	TE WELL N	ИМВЕЯ	· · · · · · · · · · · · · · · · · · ·	THANSA	SITTAL NO.		<u> </u>	
TAN DIV	ID SHEVEY	EULOGY AN	ID	Cus	CVED OV			_1				
		CION DEC		<u></u>				СЯО55	REFERENCE N	O.		
			OKD	APP	AOVED BY	DAT	Ē	ENTERE	_			
INFORMATION	SUPPLIED	BY OWNER					***************************************	<u> </u>	Ph 1	Ph	2	Ph 3
	· · · -		1						TELEPHONE			
TATOLAW V	Ayore 5	MITERIC!	INC.						!		1.27.	
				CITY			***					
	MOR AY					_			thu	ı	(23)	15.7
			١ ٧	ELL NUMBER		ADDRESS C	OF WELL SITE C	A SITE NA	ME (IE DIEEE)	RENT TH	AN ABOVE	
DWNER STATUS [] 6	SHIII ONEY	LAMOFIL	<u> </u>	LR-IU		<u>5</u> 7. (LIARLES	5 Pu	K RD			,
	BUILDEH	L. PRIVATE	HOME OW	VER					STATE		ZIP CODE	
PURPOSE OF REGISTRA	ATION FORM	EL OTHER (S	PECIFY) 1	ANDFILL		BRID	GETUNI	ĺ	M_{\odot}	ļ	1.36	44
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1							SAMPLING METH		/*************************************	**************************************	alveles and state of			1	o r 6	LAYNE-VESTERN
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							WATER LEVEL	54.0	***************************************	*******			-	TIME 11:55	14:30	LA
					•		DATE	10:11						DATE	DATE	
DATUM	NORTH	ING	10689	37.21	ELEVATION 512.0		CASING DEPTH	10/8/ 60.0	mineral converse				1	0/6/95		
DRILL RI	THE RESERVE TO SEC.	4E 7	TO THE OWNER OF THE OWNER OWNER OF THE OWNER OWNER OF THE OWNER OW	0.13	EFEANIGM 215'A	[91	IRFACE COMOTION	The second second	1,1		Maradelina a vez				<u></u>	E
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SAMPLE	HAMME	R			WAR COLUMN TO THE REAL PROPERTY OF THE PARTY	1				HARRISTA WAY			***********			1
DEPTH NV FEET (ELEVATION)	GLOW/ 6 N. ON SAMPLER	RECOMERY	SAMESO.	SAMPLER STARGOL		A	NUMBER NO OF MATERIAL	en Mente de de de de comma a manuel.			SWPG TRE			REMA	RKS	DRILLING
3 3 4	50/3		7 V V V V V V V V V V V V V V V V V V V		(0.0-1.5 ft.) Compact, brown (10YR 5/4), SIL (FILL) (1.5-19.5 ft.) WASTE, wood, asphalt, carpedemolition wastes into black composite soil	Consi	R, dry, (ML), isting of d other	n	(510.5)	: 1.5	ST (1)			troleum	m odor	HARRINGTON TO THE TOTAL
	15 17 5 6 9 22 4	0.5' (25%)	7								SP 33 SP 4					LOGGED BY
7 8 9 10 11	3 50/6	0.8° 2.0° <40%	\(\varphi \)	X	from 8.4-8.8 ft, laye with gravel sized sto	r of ones	^e dark gray S	ILT			SP (5)		0.3	ppm F	ID	· 🛎 i
11	11 50/3	0.7 <u>′</u> 2.0′ (35%)	2 Q 2 Q 2 Q 2 Q		@ 10.5 ft, asphalt						(e) Zb	ACCOUNT OF THE PARTY OF THE PAR				48
12	50/6	0.5′ 2.0′ k25%)	family Goods		from 12.0-14.2 ft, car	rpet					SP (7)		0.9	ppm P	ID	943-2848 F. 18102
14	15 50/6	0.7 <u>′</u> 2.0′ (35%)		M							B Zb	40000000000000000000000000000000000000				JOB NO:

		LAID		IIII	9/1/A/N/ BYSTEMS INC.	50		30RE	HC	DLE	LOG	***************************************	
SITE NA	The state of the s	annings/off	**************************************		A THE REAL PROPERTY OF THE PRO	ORBILING METH	XO:			micha ivani elit Militer anticos acidos	BORNG A		1
1						4.25 inch I.	D./8.25 in	ch D.D. Hall	aw Sta	em Auger	LR-10	02	
							*****************************				SHEET		z.
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					LANDFILL UNIT 2	SHELBY TUB	-		/16 inc	h I.D. (SH)	START	Fanish Time	. E
						WATER LEVEL	54.0 FT	ſ <u>.</u>			11:55	14:30	LA.
						TIME CATE	10:15				DATE	DATE	1 1
DATUM E			106893		ELEVATION 512.0	CASING DEPTH	10/8/95 60.0 FT	ALTERNATION CONTRACTOR OF THE PERSON NAMED IN CONTRACTOR OF THE PERSON NAM	~~~~~~~~		10/6/95	i " -	02
DRILL RI	and the state of the latest of	1E 7	**********			SURFACE CONDITIONS	A STATE OF THE PERSON NAMED IN COLUMN 2 IN		**************************************		1		Ę
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DEPTH WA FEET (ELEVATION)	BLOW/ 8 M.	RECOVERY	SYMBOX	8	SAMP	LE NUMBER AND			AT R		REMAR	KS	<u>8</u>
	92	8	£	MANG	DESCRIPTION	ON OF MATERIAL			SWAPLER.		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		lund
8				3			*		3				
	1	7	V V	7	(1.5-19.5 ft.) Compacted	1 \/\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\		***************************************					
18 19 20			D A		of wood, asphalt, carp	et and other	ing		SP	3			
16	5074		77	1	demolition wastes inter black composite soil	mixed with alive					0.1 ppn P	מו	
	5074	5.0	7						1 1				
17		1000	7 0	1					ZP				
-			77	1					9				l _l
18	,,		7 0							4-404			HARRINGTON
	16 20 24	5.0°	0 0							31			KR IN
19	11	(134.	7 V						SP				
			7.7		(19.5-20.5 ft.) Compact,		(4	192.5> 19.5	100	3			mi
20		L			(5GY 6/1), SILT, damp, (ML), (FILL)				ATTOMATION \$	0.1 ppm Pl	.D	
	10 8 8	0.8° 2.0°	ЩЩ	M _	(20.5-36.0 ft.) WASTE, m		<.	491.5) 20.5	1	**************************************	, .		
21	5	(402)	7 7 7 7		intermixed with medium	gray SILT,			SP	ACMATRICAL			
			7 7		moist, strong leachate	odor			111				
22	_		7 7 7 7		8 32 0 C++								
	0	0.2° 2.0° (10%)	7 7 7 7		22.0 ft., wet					31			G39907
23	13 33	CJUZJ	$\nabla \nabla$						SP				9907
			Δ Δ Δ Δ						(3)	41			
24	İ		י עיז ער							31	0.7 ppm Pl	ın İ	
= -:	28 50/4	0.0°	D D								ч , рр, , ,		
25		(OX)	$\Delta \Delta$						SP				
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			2 Q							= 1			ł
&0	0	0.4° 2.0°	Q Q									.	
_ ^=	8	(S0X)							SP			i	2848
27			77						14				943-2848
			7 4							3		_	943
<u> 28</u>	50/3	<u>0,3′</u>	V∇								0.0 ppm PI	n [,
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29			7 7						(15)	=		ĺ	SOB NO:
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division of the state of the st		_		_	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA		50	IL E	BOR	EHC)LE	LOG	***************************************	
SITE NAM	CHARLES CONTRACTOR OF THE PERSON NAMED IN	Americal	DATE OF PERSONS ASSESSED.	PO 12	STOTEMS (NO.	oksopenski grej	DRILLING METH 4.25 inch I.		th O.D. Ho	ollow Ste	m Auger	BORING LR-1		
İ								***************		***************************************		SHEET		Z.
							SAMPLING MET	KONTRACTOR CONTRACTOR				ador Lancours and an order to the land	of 6	LAYNE-WESTERN
		L	AIDLAV	//aus	RI-FS/MO		SPLIT SPOO						LTING	¥
1		٧.			LANDFILL UNIT 2		SHELBY TUB	E: 3.0 inch	0.D./2 1	3/16 incl	h I.D. (SH	***************************************	FINISH TIME	뉟
<u> </u>					GHT L		WATER LEVEL	54.0 FT.				11:55	14:30	[F]
							TIME	10:15			······	DATE	DATE	
١	IORTHI	NG: 1	06893	17.21			DATE CASING DEPTH	10/8/95	CONTRACTOR DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TRANSPORT NAMED IN		***************************************	10/6/95		
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ANGLE			MANAGEMENT OF THE PARTY OF THE	EARW	a NA		IRFACE CONDITION	<u> </u>	***************************************		averantirents-validaritistationeth	****	- Colombia de la constante de	렸
SAMPLE		₹		262 4 511 4		- ASSESSMEN			**************************************		······································	······································		()
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DEPTH IN FEET (ELEVATION)	BLOW/ 6 PA. ON SAMPLER	RECOMERY	SWEED	SAMPLER STABOL	DESCRIP		NO OF MATERIAL			SAMPLER TYPE		PENA	RKS	۵
			<u></u>	<i>V</i> ,		**********								İ
31 32	14 50/5	0.0' 2.0' (0X)			(20.5-36.0 ft.) Compac municipal intermixed wi SILT, moist, strong le	ith	medium gray			SP (16)				N
														TILTON
32	32	0.04	77 57									1.2 ppm	PID	
is.	33 35	(0X)	\[\neg \cdot \]							SP	1000mm 4420mm 4420mm			
	īz		7 0							17	=			HARRINGTON
33 = 34			7 0											HARRIN CHK'D
34	13	0.24	ΔΔ	2							***********			∄ ට
****	9	3.0% 5.0, 0.5,	$\nabla \nabla$							SP	=			
35	50/4		7 4							18				
			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \								=	1.1 ppm F	old	9/95
36	50/5	ים מי	7 0		(36.0-48.4 ft.) WASTE,	, ale	molition and							5
******		(0%) 5:0, 0:0,	7 7 7 7		construction debris, board, wood, corruga					SP	=			
37			D D		brick, etc., intermixed composite soil, moist	l wit	th black			<u>(9</u>				<u>g</u>
_			7 0								=			LOSSED
38	41		4 4								3			
_	41 50/3	0.4° 2.0° (20%)	Δ Δ Δ Δ								=			
39			<i>7</i>							SP (20)				
E			7 0											
40			$\nabla \nabla$	8> -48								0.2 ppm	PID	
	20 50/1	2.0% 0.5,	V V											
41		CXOES								SP				
40			2							21)	31			<u>æ</u>
= 42			$\nabla \nabla$											-2848
<u>- 42</u>	27 13	(30%) 5.0, 0.9,	7 V	M							=			
	27 13 25 24	(30%)								SP				943 LR102
- 43	[]	Ī	7 0							(2)				'
F			VV									10 '	חזכ	JOB NO.: FII FNAWE:
= 44	50/5	(0X) 5'0, 0'0,	V V							SP		1.0 ppm i	. S.J	
		(QX)	7 0							[3]				> [

					O/L/A/W SYSTEMS INC.		50	IL B	ORE	:H(DLE	LOG		
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						4.23	inch [.])./8.25 inch	D.B. Ha	llow St	em Auger	LR-1	02	
											4 4 - 14 - 1 - 14 - 14 - 14 - 14 - 14 -	SHEET		
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					RI-FS/MO			: 3.0 inch	***************************************		···		LUNG	ES
		'			LANDFILL UNIT 2	NAME OF TAXABLE PARTY.	*****************	3.0 inch	0.D./2 10	3/16 inc	:h I.D. (S	**************************************	FINISH	
				-	_	****************	LEVEL	54.0 FT.	####			TME 11:55	TIME	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
						***************************************	ME NE	10:15			_	DATE	14:30 DATE	1
! Letta?	NORTH	NG:	106893	37.21	ELEVATION CLOS	-	OEPTH	10/8/95				10/6/95	1	
DATUM (1G: 1E 7		5.13	ELEVATION 512.0	SURFACE (-	60.0 FT.	White work by a street or an					DRILLING CONTR
9278/ANDERSON	90*		THE STORE ST	BEARIN	G NA	SUITIFICE (AAPRA I RAPPA)		*************	**************************************	The state of the s	WWW.histochelle.wheleuwheendow.	∮ 🧖
SAMPLE	HAMME	R								**************			······································	
Aur.	Ī		T	×			***************************************	***************************************	**************************************	<u> </u>		***************************************	W-Colonia - Colonia	
DEPTH IN FEET (ELEVATION)	BOW/ 8 E.	è	ښ	SAMPLER STARGOL	(F) A A A	Co. 107 Lat. 14 Marie				E		ĺ		
ZŽ		RECOVERY	SWEED	K		PLE NUMBER AND					l	REMAI	ncs	E E
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ō				ã						"	l			
	1	T	11111		(36.0-48.4 ft.) Compac	tod LACTE				T1		WXWXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX		1
45 47 48			AA		demolition and constru	action debi	ris.			SP				1
- 46			7 72		asphalt, particle boar cardboard, brick, etc.	. intermixe	orrugat d with	ed		(3)	_=			
	6 17 15	1.8°	A A		black composite soil, from 45.0-45.5 ft., lay						ᆿ			
- 47	15 16	(90%)	7	X	medium gray (N5), SILI	ren at con I, same Gr	npact, avel,			SP				
• •			7 7	//	maist, (ML), (FILL)					24	=	:		, ,
- 48			7 0	Н							******	11 ppm P:	'n	
.446	7 18	2.0° 2.0° (2.0°	7.7	\ <u> </u>	(40.4 E0.0 C+) D	-1:		(463	1.6) 49.	4		да ррег г.	ш	
- 49	18 27 17	k100%)		M	(48.4-50.8 ft.) Dense, (5Y 4/1), SILT, with lit	tle waste	and			SP	_			HARRIN
***				Λ	demolition debris, mais	t, (ML), (FI	LL)			25	\exists			mi (
- 50				11							=			
- 50	7 9	1.6° 2.0°		\Box										
	10	(80%)	ЩЦ	M			·	(461	.2> 50.6	3 SP				0,00
- 51	12		7 0	/\	(50.8-58.0 ft.) WASTE, debris, bricks, wood, e	tc., with				89	7			, 6
			7 V		little olive gray Silt,	maist					3			لبلية
- 52	8	1.5° 2.0°	$\nabla \nabla$	7										1000ED
	11 50/5	(75%)	7	M						SP	= 1			9907
- 53			7 7	/ 🛚	@ 53.0 ft, wet					2	=		İ	
			⊽∇								= 1			
- 53 - 54 - 55 - 56	10	1.1'	$\nabla \nabla$	+							- 			
	10 14 50/4	2.0" KSSXX	7 ♥	H										
- 55	00, 1		7 0							SP				
			$\nabla \nabla$							(89)	3			
- 56	14		7 7]	0.7 ppm P	מו	1
	14 16		7 🗸	M							=			8
- 57	16 18	(K0X)	7 7 7 7							SP				-284
			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	-						(3)				943-2848 102
- 58			7 🗸					(454	.0) 58.0					940 LR102
- 30	3 50/6	0.6°	1	1	(58.0-62.8 ft.) Compact (5Y 4/1), SILT and GRA	t, olive gro	y ML ZGD		***************************************					
	JV/ 0	(30%) 0.6, 0.6,	°•	-	(FILL)	·- LL, #5 %	*************************************			SP				JOB NO.:
- 59										③				JOB NO.:
											31	02 nom Pi	_	96

	4				LAM W		SO	IL E	BORE	EHO		LOG		
SITE NAM	-	******	elekarian sarah sarah sarah	ROIE 3	YSTEMS INC.	***************************************	DRULLING METH	XO:				BORNE		
i							4.25 inch I.	0./8.25 inc	th D.D. Ho	llow Ste	m Auger	LR-10	J2	
							***************************************					SHEET	_{Mar} 6	% %
							SAMPLING METH SPLIT SPOOM		. n n / n 11	7/16 :nch	ነ ነ ነ		TING NE 6	LAYNE-WESTERN
					RI-FS/MD ANDFILL		SHELBY TUB	******	***************************************	-		·	FINISH	₹
		w		ABLE U			WATER LEVEL	54.0 FT.				TIME	'nÆ	
ļ							TWE	10:15				11:55	14:30]
				~ ~1			DATE	10/8/95				DATE	DATE	
DATUM E	ORTHI ASTIN				ELEVATION 512.0		Casing Depth	60.0 FT.				10/6/95	10/7/95	ĮĔ
DRILL RI	65-10-10-10-10-10-10-10-10-10-10-10-10-10-	E 7:		· · · · · · · · · · · · · · · · · · ·		SU	rface condition	\$ 	***************************************			iggyvanna marana ataut (1884-1884)	***************************************	ő
ANGLE			Ē	EARING	i NA	-	WEEDS CO. TO SHEET WAS ASSESSED.				, <u>,</u>	···············	······································	0
SAMPLE	HAMME	₹ T	i	weepen and				200-0000000000000000000000000000000000	The same of the sa				EXECUTATION OF BUILD	1 🙎
15 O	200 E.E.	FERNY.	ğ	SAMPLER STABOX	SA SA		NUMBER			A TYPE		REMA	∌K€	DRILLING CONTR
DEPTH IN FEET (ELEVATION)	GE SAMPLEN.	RECOVERY	SWBOL	Ä	OESCRI		OF NATERIAL			WALES		t was not a		
6				र्क		DOWNERS WANTED		and the second second second second	·				HARRIST WITH COLUMN TO STATE OF THE STATE OF	1
	13 19	2.0' 2.0'	III•.	T	(58.0-62.8 ft.) Compo	ict, o	olive gray	· · · · · · · · · · · · · · · · · · ·	***************************************	····	w			1.
E	9	K100XX		M	(5Y 4/1), SILT and G (FILL)	IKAVE	L, WET, (ML/UP),		SP				_
61]'"									[3]				
E 60			o °											
<u>├</u> 62	13 33 32	1.4' 2.0'	e *	∇										Z mi
63	32 35	(70%)	Щ.,	H —	(62.8-76.0 ft.) WASTI	E. der	nolition debris	(4	49.2) 68		=			
63			\D \D		that appears to ha wet to moist, with s	ive bi	een lourned,			32	_			HARRINGTON CHK'N RY
E 64			7									0.1 ppm f	olo] 팀
-	8 40	1.1 2.0	7	M	below 64.0 ft, waste	e pec	omes moist to	aamp						mi mi
E 65	50/5	V5571	ס ל	/ \						SP				
			2							[33]				%
E-66			4 4								_=			56/6/
	65 49 25 50/1	0.5' 2.0'	2	M										<u>}</u>
E 67	25 50/1	K25X)	77							SP				la
			7 7 7 7							34				LOGGED
— 68			7									0.0 ppm	מוכ	7 2
	8 29 21 12	0.4' 2.0' (20%)	V V	24							31			
- 69	12	(50%)	7							SP (35)				
			70							(33)				l
- 70	1.		7 7								ened enemak			
3-11937	4 9 12 27	(30%) 5:0, 0:0,	$\nabla \nabla$	M										
71	12 27	K30X)	7 V							SP				
= '	-		77							36	3 1			48
E 72			7 7	\square								0.1 ppm f	PID	943-2848
= '*	28 17 30 50/5	(80%) 7.5,	$\nabla \nabla$							1 1	3	• •		943 LR102
E	30 50/5	(60X)		/\						ZP				=
73			70	H						37				ن : ا
			2											2 3
 7 4	50/2		D D							SP				JOB NO.:
		(0%)								39		0.7 ррм	PID	ا د⊸ ل

	.6				A A AU SYSTEMS INC.	SO	IL E	ORE	HC)LE	LOG		
SITE NAM	THE PARTY NAMED IN	V	NAMES AND DESCRIPTION OF	AOIC	4101CRO INC.	DRILLING WETH	: :	***************************************	HHADAA MAAAA AAAA AAAA AAAA AAAA AAAA AA		BORNG N	io.	1
						4.25 inch [.D./8.25 inc	h D.D. Hol	low St	em Auger	LR-10)2	
											SHEET		ر آ
						SAMPLING MET		entrocentura en companyo en companyo en companyo en companyo en companyo en companyo en companyo en companyo e			6 o	ş 6	NAME - NESTERNA
					RI-FS/MO	SPLIT SPOO		***************************************	********			LING .	1
		٧.			LANDFILL UNIT 2	TELET YELLEN			3/16 inc	h i.D. (SH)	START TIME	FWHSH TIME	<u>ا</u>
						TIME	54.0 FT.		***************************************		11:55	14:30	\(\)
						CATE	10:15 10/8/95				CATE	DATE	1
n B wutak	IHTROI ASTIN	NG: 1	106893 514788	37.21 3.13	ELEVATION 512.0	CASING DEPTH	Annual Control of Cont			Mario Comenzation Mario Mario	10/6/95	10/7/95	0
DRAL RK		E 7				SURFACE CONDITION	CONTRACTOR OF THE PARTY OF THE						1 5
WGLE	90*		(BEARWI	G NA						za doblobiologicznie wko	Strain Strain Commission of Strain St] 8
AMPLE	HAMMEI	R	Alizz 11* 14* 11/7										ي [
DEPTH IN FEET (ELEVATION)	BLOW/ S.EN. ON SAMPLER	RECOMENY	SMAGOL	SAMPLER STABOL		eple number and					REMAR	XS	
HEGO GO	MO NO	185	8	SWPE	DESCRIP	tion of Material							
- 76 - 77 - 78 - 79			70		(62.8-76.0 ft.) Compac	ted WASTE,			SP		CHECK THE SECOND		
- 76			7 7 7 7		demolition debris, mois some olive gray Silt	st to damp, with	(4)	36.0> 76.	.0 38				
- /0					End of Soil Borehole	Log at 76.0 ft.				40.57			
- 77		ĺ											
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- 78				:									MULTUNICATION
74										40000			Į į
- 79										10000			2
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- 80													
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- 81										31		:	
- 82													AD UDOOL
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- 87													943-284B
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- 88													
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- 89										-			or or
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Well No. LR-102

Boring No. X-Ref: LR-102

	PIEZOMETER CONST	RUCTION SUMMARY	
	Survey Coords: Northing: 1068937 ft. Easting: 514788 ft.	Elevation Ground Level Top of PVC Casing	512.0 ft. NGVD 513.52 ft. NGVD
	Drilling Summary:	Construction Time log:	Start Finish
-10 N	Total Depth 76.0 ft. Borehole Diameter 8 1/4" (0.0-76.0') Casing Stickup Height 1.52 ft. Driller Layne-Western St. Louis, MO	Task Date Drilling CME 750 10/6/95	Time Date Time
20	Rig CME 750 Bit(s) 4 1/4" ID Hollow Stem Auger Bit Drilling Fluid None Protective Casing 8x8" Square Steel, by 5' long	Geophys.Logging: Casing: 2" I.D. PVC 10/8/95 Filter Placement: 10/8/95 Cementing:	14:30 10/8/95 15:05 12:50 10/8/95 15:45
30 MINING TO THE STATE OF THE S	Well Design & Specifications Basis: Geologic Log X Geophysical Log Casing string(s): C = Casing S = Screen	Development Bentonite Grout Bentonite Seal Well Development	16:20 10/8/95 15:45 10/8/95 15:55
	Depth String(s) Elevation + 1.52 - 54.90 C1 513.52 - 457.10 54.90 - 59.70 S1 457.10 - 452.30 59.70 - 60.00 C2 452.30 - 452.00		
-50	Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings C2 2" dia. threaded PVC end cap (4" long or 0.33') Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine	Stabilization Test Data: Time pH Spec	c. Cond. Temp (°C)
-60	Sand Pack: 16-35 mesh Silica Sand 52.2-61.6'	Recovery Data:	New York Committee Control of the Co
-70	Filter Pack: Less than 50 mesh Silica Sand 50.8-52.2' Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-47.0' Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 47.0-50.8', Chips 61.6-76.0' Concrete: 0.0-3.0'	100 90 80 70 60 50 80 70 60 50 10 0 0 20 40	60 80 100
-80	Comments:	TIME (Minu	tes)
Not to Scale	Supervised by B. Harrington Site Job Number 943–2848 File Name	LAIDLAW/OU2 RI-FS/MO LR102	

File Name LR102

943-2848

Job Number



MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND
LAND SURVEY
MONITORING WELL

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145106	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED
ACTOR	Ph 1 Ph 2 Ph 3

	MONITORI	NG WELL			CHECK	VED 81				ROUTE			•	
	CERTIFICA				i	OVED BY				ENTERE	_			
INFOR	MATION SUPPLIED	BY MONITOR	RING WELL	CONT							Ph.1		Ph 2 P	h.3
LAIL	DLAW BRIDGETON	I SANITA	RY LAND	FILL	WELI	L NUMBE		-102						
SITE ADD	CHARLES BOCK	₽p		CITY	Ro	IDGE	ו ורמ			ST	ATE		ZIP CODE	
OWNER N	AME			<u>l</u>			104			TE	LEPHONE		63044	
LAID	DAN WASTE S	STEMS, I	J C .	T	·		· ·		····		314-	24	1-3710	
	3 N. BRUNDWAY			CITY	SŢ.	الاداما :	15			ST	ATE C		ZIP CODE 63102	
VARIAN	ICE YES DATE ISS				-	LOCAT SHOW L		OF WEL	L		C	COUNT	γ <u> </u>	15
	- / VANIANCI	NUMBER: V				SECTIO	N PLA	T		SUF	IFACE ELE	VATIO	N_ 512.0	
DESCRIE	LOCATION OF THE WE	LL SO WE WOUL	D BE ABLE TO	VISIT IT				1 - 1		· ·				
<u>i</u>	NEST SIDE OF S INE AND 1580' P	DIE, SYD E	NOT OF I	FENCE	=		:4:	SMALL	ESTW				LARGEST	74
		TUP OF HIL				-::-	<u>:</u> :-	•	% .				_%	_¼
	750V					=	10	SEC		TWN	47	. N,RI		ŒØĦ W
						LAT.	٠. د٠	46	, <u>0</u> -	L" L	ong. <u>9</u> 0	<u>o</u> .	26 53	<u>'-" </u>
	ORING WELL INSTA ACTOR'S NAME	LLATION	LAYNE 1	Ne ste	en (Cal	. I./		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1	RMIT			
DRILLI	NG CONTRACTOR'S							-			MBER	<u> </u>	GIASE WIPK	1
NAME					ESTERN Co. INC. PERMIT NUMBER OCISS WPA						21358 WPM			
TYPE	☐ MONITORING WEL	L TYPE O					FORM			FOR 10	HECK ALL 1	THAT A	Dr Vi	
OF WELL	PIEZOMETER		LANDFI	LL	OT			-	V.O.C.				TROLEUM PRO	DUCT
PRO- TECTIVE	LENGTH DIAM	ETER OF WEIGHT	OR DIAMETER	HOL DIA	NTS		7	□				. (ONLY	
CASING DETAILS	5 FT B		DEPTH OF	E.N. 🗆	MECHA	NICAL E		.DED	IX STEE	. [] i	HERMO PL	ASTIC LYMER	LOCKING CAP?	,
(IF USED)	CAP VENTED	MATERIAL	5 76	FT. D					TYPE		···		1	ĺ
	120 L NO CO	ING CEME	VT TO	THE BOT	TOM OF T	HE T	YPE OF	el son	BOVE GROUN	n	CONSTRU	CTED	HE FLUSH MOUNT	WAS
	WEEPHOLE? DET	AILS OTHER		3.0)	C	OMPLE TION	TU FL	USH					
CENTRALIZ ON RISER					МАТЕЯ			 	MOUNT					
		TED AT	WEIGHT OR		-	AINLES		LOC						
RISER PIPE DETAILS		RISER PIPE	SDA #		IETER OF L HOLE	1	INTS MECH	- - - - - - - - - - - - - - - - - - -	X THR	EADED	MATERIAL STEEL		THERMO PLAST	
DETAILS	56.5 FT.		N. 5CH 80		3/4	ואו 🗆	OTHE	A			OTHE		→ FEOOHO POLYM	<u></u>
ANNULAR	CEMENT SLURRY BENTONITE SLURRY	? BAGS		SLURRY	BENTO	100	TERIAL ENTO	_			LENGTH OF SEAL		BENTONITE SEAL NSTALLED IN	
SEAL	NON SLUARY BENT	51411E % BE	ENT USED NTONITE USED .		SEA	Œ 🗷	SLU	RRY	□ сн				UNSATURATE ZONE	:D
	TYPE	GRAIN SIZE	R USED/BAG	GAL.	METHO		GRA		PEI	LETS	3.8	[SATURATED 2	ONE
PRIMARY FILTER PACK	SAND MANUFACTURED		PACK			LATION		column t	o be In the Feet	FEE	Vi [1	FORMATION	ļ
	NATURAL TYPE	GRAIN SIZE	9.4 LENGTH OF FIL	FT.		A. POL	R	from Ser column	face	SURFA	CE	U	ESCRIPTION	
SECONDAR FILTER	SAND MANUFACTURED	G, William St. E.	PACK	IEM	METHO!			Depth to	battem of		0-1	5 0	layey silt	
PACK	NONE LENGTH OF SCREEN	DIAMETER	1.4	FT.	H.5.4		JR.	Protectiv Seal:	e Caring	3.0	1.5-	76 7	Trach	
WELL SCREEN	Tanasi de de la casa d	DIAMETER	SLOT SIZE WEI		MATERI.	STIC								
	5 F			H80	STE FLU	EL IORO POL	YMER	Depth to Annular :	Base of Seal:	47.6	min .	التيمار .	Section 1	
SUMP DETAILS	Landin of domp	DIAMETER OF SI		ERIAL PVC	□ s									
			🔲 1	FLUORC OTHER	POLY	MER		Depth to Bentonite		50.8	.			
BACK FILL	WAS THE WELL BACK FILLED?	MATERIAL USED	1	IGTH OF TE HOLE		FILLED		Dapih to						
	YES NO	MED. BEN	14.	4'				liter Pack:	52.2					
TATIC WAT	MEASURING P	CINT SUBMIT ADE	ASED WELLS DITIONAL AS BU	SIT DIAG		NOMINO.	,,,,,,	Screen:	Top of the	55.0	2			
	TIC WATER LEVEL	CASING, HOLE	ON DETAILS INCLEDIAMETERS, AND	.HDING T	YER AND	D SIZE OI	FALL		ļ					
TOP OF	POINT FOR STATIC WATER LEV RISER PIPE	EL IS DRILLING ED	_	ירט דעט	- A'l	4 H.S.,	Α.	Depih to I the Screen	aollom of	60.0	,			
OTHER.	F MEASURING POINT	REVERS	_		E	*		Total Dep	th:	76.0	,			
	513.52	ROTARY									COMPLETED		D-08-95	
	CERTIFY THAT THE N AL RESOURCES REQU		VELL HEREIN R THE CONS	DESC TRUCT	RIBED ION OF	WAS C	CONS	TRUCT	ED IN A	CCOR	DANCE V	VITH '	THE DEPARTM	ENT
IGNATURE P	RIMARY CONTRACTOR/PERM	li T #	DATE			NATURE							DATE	
(<u>)</u> (기. 5.년 3 780-1415 (7	<u> プ) //けんはからが.</u> -95) / Di	STRIBUTION: W	HITE/DIVISION	CANAR	VALCABLE	TORING		1/6		<u>: //</u>	·		11-15-75	5
	J M	AL WHITE COPY T	O: DEPARTMEN	T OF NA	TURAL P	RESOURC	772LL (265, P.)	O. BOX 2	SO ROLLA	NAZOWA NO 85	1EH 402		€ #cvci	EPARG DE

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402 ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

	4	L	A		ALANIV SYSTEMS INC.		SOI	L B	ORE	HO	LE	LOG		
SITE NA					- 101 Marie 1100-	DR	RITING METHO);	······································			BORNIG I		1 1
							4.25 inch I.D.	/8.25 incl	h O.B. Hol	low Ste	m Auger	LR-1)3] [[
							·					SHEET		₹
						******	WIPLING WETHO	-	***********				r 3	LAYNE-WESTERN
					RI-FS/MD	ļ	SPLIT SPOON	·			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		LING	¥.
				LAKE L RABLE I	_ANDFILL UNIT 2		HELBY TUBE			3/16 incl	ı I.D. (SH	START	FINISH	岁
						W/		26.74 FT			╃	14:00	9:00	5
1						-	DATE	9:16		<u> </u>		DATE	DATE	1 1 1
DATUM	NORTHI				ELEVATION 460.1	C	SING DEPTH	10/20/95 38.0 FT.			_	10/19/95	ł	
DRILL R		E 75	-	/,0/	CCENNIAN 490'I		E CONDITIONS	-	<u> </u>	<u> </u>	f		<u> L</u>	E
ANGLE	90°	744A		BEARING	3 NA									CONTR
SAMPLE	HAMME	R												7 1
-	Τ			ğ						1,,		, , , , , , , , , , , , , , , , , , ,		DRILLING
巴舍	BLOW/ 6 IN. ON SAMPLER	È	늄	1 2	SAME	NE NU	MBER			3	11			
I E	≥3	RECOVERY	SYMBOL	85	DESCRIPTI	AND ON OF	MATERIAL			Mark Di]]	REMAI	us.	۵
DEPTH IN FEET (ELEVATION)	89	æ	*77	SAMPLER STAROL						3	11			Ì
		<u></u>		<u></u>									/	-
	Ş	1.0' 2.0'	M	M	(0,0-2,5 Ft.) Stiff, mod brown (10YR 5/4), CLAY	erate	yellowish c		***********				**************************************	1 .
= .	4 6 8	(50%)			Gravel, occasional cabi					S₽	= 1			
= 1	ľ				ML), (FILL)					0	31			11. TON
E _										1 1	31			
_ 2	17 12	1,3° 2.0°						£45	57.6) 2	.5				, ai
=	13	(45X)	M	H	(2.5-3.5 ft.) Very stif	FF, MRO	tium gray			SP	31			를 2
- 3	16				(N5), SANDY SILT, little occasional cobbles, SR	' qoub'	uravel, (ML),			2	71			
2 3	1				(FILL)									SANDECIRT CHK'D B
= 4	9 10	0.7' 2.0'			(3.5-7.5 ft.) Very stif gray (SB 5/1), SILT, ir	ff, med ttle c	dium bluish -f Sand, VR,							* C
E	8	(32X) 5'D.			damp, (ML), (FİLL)					SP	= 1			
5	11			 						3				
E											=			6/8
F 6	3	<u>1.2'</u> 2.0'									=			N 10/23/95
E	5 4	\$500 5.0		H						SP	31			1 44)
7	4	ŀ								④				LOGGED DATE
E	1				(7.5-10.0 Ft.) Stiff, me	dium _lig	ght gray				31			LOGG
8	3	1.1'		 	(N6), SANDY SILT, little damp, (ML), (FILL)	2 C-F	nuaner 2K							
	3 5 4	(32X) 5.0, 11,		H						SP	31			
<u> </u>	4			H						(3)	-31			
=											=			
10	12	1.67			(10.0-19.3 ft.) Firm, ner	diun gr	-ay (N5),							
_	ខេត្ត	1.6' 2.0'		M	SILT, little fine Sand, staining, SR, damp, (ML)	trace	norii C22			SP	# 1			
<u> </u>	ž			M	a tanning any amin'ny man	7 72				<u>©</u>				
E											引			48
- 12	1.			-							크	e 12.0 ft. Hale bega	n makina	943-284B 103
E	Ş	1.4° 2.0° c7020		M							31	gas at lo		943 LR103
E_13	200	C7020		1						25 (2)	41			[5
				-							目目			1
E 14				$\parallel \downarrow$							크			JOB NO.: FILENAME:
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	4	(300%)								ⅎ	_ - I			ے ت

		_	-		TUAN	SOI	L B	ORE	EHC	LE	LOG		
SITE NAM		***************************************		WASTE	SYSTEMS INC.	DRILLING METHOL	······································				BORING N	0.	
						4.25 inch I.D.	/8.25 incl	h (J.D. Ho	low Ste	n Auger	LR-10	3	
								*****			SHEET		Z.
						SAMPLING METHO	XO:				2 0	# 3	LAYNE-VESTERN
		LA	I DL.A	W/OU	2 RI-FS/MD	SPLIT SPOON					DRIL	TING	VES
		W	EST	LAKE	LANDFILL UNIT 2	SHELBY TUBE	: 3.0 inch	0.0./2 13	3/16 inci	a I.D. (SH)		FINISH	닐
			TL.C.	KADLL	C1411 5	WATER LEVEL	26.74 FT	<u> </u>			TME	TIME	LAY
!	•					TIME	9:16	<u> </u>	<u></u>		14:00	9.00	
	IORTHI					DATE CASING DEPTH	10/20/95	1			DATE 10/19/95	DATE 10/20/95	~
DATUM E		G, 5		7.07	ELEVATION 460.1		38.0 FT.	<u>L</u>	<u> </u>				E
ANGLE	-	FS.	, u	BEARM	NG NA	SURFACE CONDITIONS	——————————————————————————————————————		*****				CONTR
SAMPLE		?											Ī
**************************************	T	T		占			····					*************************************	DRILLING
OEPTH IN FEET (FLEVATION)	BLOW 6 IN. ON SAMPLER	E	,	SAUPLER STARBOL	CHE	PLE NUMBER			¥	11			I ⊒
≇ §	28	RECOVERY	SYMBOL	K		AND TON OF MATERIAL					REMAR	KS	5
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	<u> </u>	<u>L</u>		<u></u>	·Minimum								
	Г	T	Ш	17	((0.0-19.3 ft.) Firm, neo	diun gray (N5),	······································	·	SP			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
= = 16	1			M	SILT, little fine Sand, staining, SR, damp, (ML)				®	31			
16	3	50.		\Box					H	-11			Ž
	3 4	물음' 물음'		M					50	31			TIL. YON
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18	1	2.0'		1	from 18.9-19.0 ft, wet	: Zone							SANDFORT
_	5 5	2.0° 2.0° 2.0°		M					92	31			SANDED
19	4			K			(4-	40.8) 19		-=			Σ O
				31	(19.3-24.2 ft.) Firm, gr SILTY CLAY, NR, damp,	ayish black (N2),			٦٣				
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=	6 12 17	2.0° 2.0° 1002)		11	(24.2-38.0 Ft.) Compac medium dark gray (NS	to N4), fine SAND	,			= 1			
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	4	20 15		M						31	encountere	d water	48
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29	15 15	£100x3		N					SP	41			JOB NO.: FII FNAME
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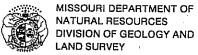
	4		-	DINEYIY TE SYSTEMS INC.		SO	L B	OR	EHC	LE	LOG		
ITE NAM						DRULLING METHO	Ò:				BORING N		
						4.25 inch [.[./8.25 incl	n O.D. Ho	ollow Ste	m Auger	LR-10)3	
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						SAMPLING METH	00:				3 0	F 3	TER.
		LA	tni aszzo	IUR RI-FS/MO	[SPLIT SPOOM	; 2,0 Inch	O.D./1.5	inch I.D.	(SP)	DRIL	LING	LAYNE-WESTERN
		W	EST LAK	E LANDFILL		. SHELBY TUB	9.0 inch	0.0./2 1	3/16 Incl	n I.D. (SH)	START	FINISH	Į.
		I	OPERABL	E UNIT 2		WATER LEVEL	26.74 FT.				THE	TIME	AY
						TIME	9:16		J		14:00	9:00	
	MET: 14	41°. 10		10		DATE	10/20/95				DATE	DATE	
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DRILL RIG	CM	E 75	0		SUI	RFACE CONDITIONS]
ANGLE	90*		BEA	RONG NA									DRILLING CONTR
SAMPLE I	HANNE	₹											ල
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DEPTH IN FEET (ELEVATION)	BLOW 6 PL	=	SWBOL.			, 1000			18				
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•	7	2.0' (75%)	iiii V	medium dark gray (trace Silt, NR, dans	N5 to	N4), Fine SANI			SP	31			
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Well No. LR-103

Boring No. X-Ref: LR-103

PIEZOMETER CONSTRUCTION SUMMARY

	Survey Coords: Northing: 1068527 ft. Easting: 515217 ft.	Elevation Ground Level Top of PVC Casing	460.1 ft. NGVD 461.28 ft. NGVD
r i in	Drilling Summary:	Construction Time log:	
-10	Total Depth 40.0 ft. Borehole Diameter 8 1/4" (0.0-40.0') Casing Stickup Height 1.10 ft. Driller Layne-Western St. Louis, MO	Task Date Drilling CME 75 10/19/95	tart Finish Time Date Time
	Rig CME 750 Bit(s) 4 1/4" ID/8 1/4" O.D. Hollow Stern Auger Bit	Geophys.Logging: Casing: 2" I.D. PVC 10/20/95	B:55 10/20/95 8:59
-20	Drilling Fluid None Protective Casing 8x8" Square Steel, by 5' long	Filter Placement: 10/20/95 Cementing: 10/20/95 Development 10/20/95	9:10 10/20/95 10:25 10:35 10/20/95 10:60
-30	Well Design & Specifications Basis: Geologic Log X Geophysical Log Casing string(s): C = Casing S = Screen	Bentonite Seal 10/20/95 Well Development	10:28 10/20/95 10:35
	Depth String(s) Elevation + 1.10 - 28.60 C1 461.28 - 431.50 28.60 - 38.40 S1 431.50 - 421.70 38.40 - 38.70 C2 421.70 - 421.40	Stabilization Test Data:	
-50	Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings C2 2" dia. threaded PVC end cap (4" long or 0.33") Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings	Time pH Spec.	Cond. Temp (°C)
-60	Sand Pack: 16-35 mesh Silica Sand 25.3-39.7'	Recovery Data:	
-70	Grout Seal: Wyo-Ben Grout Well Bentonite Slurry 3.0-13.0' Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 13.0-23.6' Concrete: 0.0-3.0'	20 20 TIME (Minute	60 BO 100
-80	Comments:		
Not to Scale	Supervised by M. Sandfort Site Job Number 943–2848 File Name	LAIDLAW/OU2 RI~FS/MO LR103	



OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145107	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED
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DRILLIN NAME	G CONTRA	CTOR'S				WEST				*****		F	PERM	IT			
11/AIII/L						CONST				IOITA	ı	11	NUMB	ER	- 0	01258 W	/PM
OF E	MONITOR PIEZOMET	ING WELL EA		TYPE OF POTENTIAL SIT	E 🖾 LAN		MATE			E	V.O.C.					'LY) ROLEUM P	RODUCT
	OTHER ENGTH	DIAME	TER C	F WEIGHT	JL L.U. DR DIAMI	OL DNA RETE	INTS	<u>-</u>	Пты	EADED	OTHER		Tuer	IMO PLAS		NLY LOCKING CA	97
CASING DETAILS IF USED)	5	FT. BYE		SDR#	DEPTI	74 ***	MECH		L 🗆 WE			-	FLUC	POLY	MER	⊠ YES □	
1	YES N	CASIN		MATERIAL CEMEN		DEPTH FRO	TTOM OF	THE	TYPE O	X AE	OVE		DE	SCRIBE H	OW TH	E FLUSH MOL	INT WAS
¥	EEP HOLE?	GROU DETAI	JT LS	Z CONC	ere" :		74150		SHREAC	Eĺ	GROUN USH	D A					
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ON FLISER	☐ YE	S LOCATI					_ 🗆 s	TAINL	ESS STE	EL 🗆 C			_ -				
HISER PIPE DETAILS	_{ЕМБТН} 31.2.		ISER	_	WEIGHT SOR#	DA	DRILL HOLE						TERIAL STEEL OTHER		THERMO PL FLUORO PO		
ANNULAR	CEMENT S			BAGS	NT/BENTO! OF	NITE SLURR	Y	ONITE	MATERIA	L.				IGTH OF		NTONITE SE/ STALLED IN	AL.
SEAL	NON SLU	RY BENTO	NITE	₩ BEI	ENT USEO NTONITE U ER USED/BA	SED GAL	SE	EAL	⊠ SLU					10,6	- 1	UNSATUR ZONE	
PRIMARY FILTER	TYPE SAND		GR.	AIN SIZE	LENGTH C		METH	METHOD OF INSTALLATION			Information in this column to be supplied in the Feet		EET ROM		F	SATURATION	ED ZONE
PACK	MANUFAI NATURAI		-	16-35 AIN SIZE	-	.7 FT.			POUR	from Sui			RFACE		DE	SCRIPTION	
ECONDARY FILTER PACK	SAND MANUFAI	CTURED		IVO	LENGTH C	_	INSTA	OD OF	ON POUR	Protectiv	bottom of a Casing	l .	_	0-7	Grav	relly cla	24
WELL SCREEN	LENGTH OF SC	REEN	DIA	METER	SLOT SIZE	WEIGHT OR	MATE!	RIAL .ASTIC		Seat:		3	0.0	7-26	5il	Ity clay	
	LENGTH OF SU	FT.	DIA	2 IN.	ID.	SCH BO		TEEL LUORO	POLYMER	Depth to Annular		-12	3.0				
SUMP DETAILS		•••			241)	☐ PVC ☐ FLUOR	O POL	STEEL YMER		Depih to Bentonita		2:	3.6				
BACK FILL	WAS THE WELL FILLED?		МАТ	TERIAL USED		LENGTH O BORE HOL	F BACI	K FILL	ED	Depth to			5.3				
TATIC WATE	RLEVEL FE	T FROM ASURING PO		MULTIPLE C	ASED WELL:	<u>. </u>				Depth to Screen:	Top of the		ده	26-4	5 د	ilty san	d
	IC WATER LEVEL			CONSTRUCTI CASING, HOLI	ON DETAILS EDIAMETERS	S BUILT DIA S INCLUDING S, AND GROUT	TYPE A	SHOW! ND SIZ	ING WELL E OF ALL								
TOPOFF	DINT FOR STATIC	WATER LEVE		DRILLING ED	UIPMENT	AUGER TY	_{DE} 4	/4 H	.s.A.	Depth to the Scree	Battom of	40					
OTHER_	· MEASURING PO	INT		□ REVERS		OTHER	FE	• • • •		Total Day		40	0.0				
****	461.28			HOTAR	4		COICE	D 1414			LL DAILLI				10.	- 20- 95	
FINATURA	CERTIFY THA	ES REQUI	HEN	MENTS FO	H THE C	DNSTRUC	TION (OF MO	ONITORI	NG WE	LLS.	ACC(URDA	NCE W	TH T	HE DEPAR	TMENT
UNATURE PR	MARY CONTRAC	45 . 1			DA.	11-15-9	< 17	Post	URE DRILL	7)1.1	V	· · · · ·				DATE	5.95
780-1415 (7-9	35)	DIS	TRIE	UTION: W	HITE/DIVIS	SION CANA	RY/MOI	NITOR	ING WELL	CONTRA	CTOR PI	INK/C	OWNER	*********			SEACHDANS .

DATE SIGNATURE DRILLER/PERNIT *

11-15-95 CONTRACTOR PINK/OWNER

PISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER

MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402

ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

	4	L			ANAYAY YBTEMB INC.		SO	L E	BORE	НО	LE	LOG			***************************************
SITE NAM				AGIE G	101cmo (nu.		DRILLING METHO	D:	······································			BORING N	Ю.		
						Ì	4.25 inch [,	0.78.25 in	ch D.D. Ho	ilow St	em Auger	LR-10)5		
-											N 6.44.475131-124.7444 (A14.444	SHEET	<u> </u>	Z	
							Sampling Meth	00:] 1 o	F 3	E	
		L.	AIDLAV	VOU2	RI-FS/NO		SPLIT SPOON	: 2.0 inch	O.D./1.5 #	ich I.D.	(SP)	DRK	LING	LAYNE-VESTERN	
			EST (ANDFILL		SHELBY TUBE	3.0 inch	0.0./2 13	/16 incl	LD. (SH)	START	FINISH	낼	
			uruk	MBLE U	MII E		WATER LEVEL	21.3 FT.	32.0 FT.			TIME	TIME	LAY.	-
1							TIME	13:50	11:00			9:45	14:45		
,	ORTHI	NG: 1	106770	9.56		ļ	DATE	1	10/04/95		ļ	DATE	CATE		
DATUM E		G: :		1.56	ELEVATION 484.2	1	CASING DEPTH		36.0 FT,			10/03/93	10/03/95	E	
	90°	IE, /		BEARING	NΔ	SUI	FACE CONDITIONS	<u> </u>	**************************************					CONTR	
SAMPLE		R		SCALIANS.	Ne							.,,			
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DEPTH IN FEET (ELEVATION)	BLOW/ 8 R. ON SWIPLER	RECOVERY	SYMBOL	SAMPLER STABOL	SAL	#PLE	NUMBER In			1		REMAR	ve	DRILLING	
Mars)	10 E	Ð	8	P ES	DESCRIP	TION"	OF MATERIAL			SAMPLER		NEMPO			
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	<u>[</u>	1.8 2.0	m	ΓT	(0.0-2.2 ft.) Compact,	modi	erate yellowish	ì		ТТ	— —	· · · · · · · · · · · · · · · · · · ·			
1 2	6	(70X)		M	brown (10YR 5/4), SIL (CL), (FILL)	TY C	LAY, NR, dry,			SP	31				1
1	8			N						10	41				图
E				Ц	2 1.3 ft. damp						31				TIL TON
2	4	1.3'		!	(2.2-3.2 ft.) Loose, U	ah+	olive conu	(4	82.0) 2.	리ー	=				mi
:	3 7	2.0°		H	(5Y 5/2), SILT, NR, do					SP	31			8	בׂ
F 3	43	Ì	ЩЦ		(3.2-29.2 Ft.) VASTE,			(4	181.0> 3.		= 1			HARRINGTON	<u>—</u>
E					TOIL LAL I WASTLE	wasi	1				目目			AR	CXE
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늗	2346	CS2X)	V V								∄	ador	-,,		
E-11	6		77							SP	41				ŧ
			7 0							(6)	31		ļ	₽	
<u> </u>	5	۸.	7 7	H						H				943-2B4B	
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8 9 10 11 12 13 14			7 7											JOB NO.:	FILENAME
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<u> </u>	50/4	(50%)	7 0							B			1	=5	٠

	4	Aini	AW W		SYSTEMS INC.	SO	IL E	BORE	HC)LE	LOG	ļ	
SITE HANK			1 111		10100	DRILLING METH	Ю:				BORING N	· · · •	
						4.25 inch I	.D./8.25 in	ch D.D. Ho	ilow St	en Auger	LR-10)5	
											SHEET		2
						SAMPLING METH	ico:] a 0	yr 3	TER
		1 4	. FTM AL	e esti arti	RI-FS/MD	SPLIT SPOO	4 2.0 Inch	G.D./1.5 k	ich [.D.	(ያዮ)	DRM	LING	LAYNEWESTERN
					LANDFILL	SHELBY TUB	E: 3,0 Inch	n 0.0./2 13	/16 inc	h I.D. (SH	START	FINISH	
			OPER/	ABLE	UNIT 2	WATER LEVEL	21.3 FT.	32.0 FT.			TWE	TIME	A
						· TIME	13:50	11,00			9:45	14:45	_
1						DATE		510/04/95			DATE	DATE	
DATUM E	ORTHI ASTIN				ELEVATION 484.2	CASING DEPTH		36.0 FT.			10/03/95	10/03/95	ρ
DRILL RIG	The second name of	E 75		****	**************************************	SURFACE CONDITION						h	2
ANGLE S	90"		E	BEARIN			·		-	**************************************			GTNO
SAMPLE H	MMME	R											ì
I	Ī			정			**************************************				2141 - HGC		
暖		È	ا پر ا	1	SALE	LE NUMBER					ä		
* §	28	RECOVERY	SYMBOL	1 8		AND ON OF MATERIAL			SAMPLER TIPE	11	REMA	स्ट	ן ב
DEPTH IN FEET (ELEVATION)	BLOW/ & PL. ON SAMPLER	2	6	SAMPLER SYMBOL	TATALAIPER WEET SPI								
	<u> </u>		<u> </u>	A			~~~~~				····		
	Γ	T	V V	П	(3,2-29,2 Ft.) VASTE, d	anp			SP				
E	•		יסק						(3)	∄ [
E-16	l 5	0.9	2 Q	\forall					H	31	0.0 ppm P	ID	
	9 3 5	2.0	2 Q 2 Q	H						= 1			
L 17	6	L.SKI	70	H					SP				
	ļ		7 7						9	= 1			,
18	İ		77							劃			LABBINETER
E'°	3 5 7	2.0°	7 7 7 7	V						31			1
=		£4\$2)	7 0						2b	크			
18	50/3		V V						100	7			<u>.</u>
E			7 7 7 7	. [
20	50/5	0.4			from 19.9-23.8 ft, som					31	0.0 ppm P	· E D	
	50/5	50	A A		granular soil intermixe	d with woste				=	man leaders a	_	
- 21			7 7 7 7						SP	= 1			
	ļ		7 7							크ㅣ			3
E_22	}		77	Ц						三日			
= 	7 13	1.0° 2.0° (50;0	VV	M						=			
=	7 13 20 12	(50;0	7 🗸	71					SP	# 1			1000
23	12		7 0	H					12	-			
E I	1		4 4	1									
24	7		7 0	1					}	-31	Landfill	as adar	
<u> </u>	le.	1.4° 2.0° (78%)	7 0	M						∃ \	Landfill g	ID	
25	8 19 17	1,200	Q Q	N					SP	4	Lost sho Split Spo	on on	1
= -	1		Þ ▽	Н					(3)	= 1			
	1									<u></u> =			
<u> </u>	13	1,5		\Box						3			١ .
E	13 21 17 25	1.5° 2.0' (75%)	77	11					SP				988
27	25	ł	7 0	"					1				9494-649
늗			(v v	H					19) 8
27 28 : 29			7 🗸							4	00 T	i n	
·:	9 37	1	7	1						= 1	0.0 ppm P	ıμ	
E 🦡	9 37 15 11		7 4	1	(29.2-30.0 ft.) Compact				ZP	_킈ㅣ			5
<u> </u>	l''		77	1	(N5), SILTY ELAY, NR, *				(3)				ON GO
]		70	1	From 29.2-29.8 ft, lay	er of LIMESTONE	:			l E			∫ ⊊

	4			-	L/A/II/		S	01	L B	OF	RE	HC	LE	LOG		1
SITE NAM				ADIE 2	ISTEMO INU.		068LLING (D: 0./8.25 inc	ch ().0	. Hall	aw St	en Auger	BORBNG H		
											······································			SHEET		[₹
							SAMPLING	_							F 3	LAYNE-WESTERN
		L.A	\[DLA\	N/DUS	RI-FS/MO				2.0 inch	-					LING	Į į
		₩		LAKE L ABLE L	ANDFILL INIT 2		**************************************		: 3.0 Inch	/.מ.ם	2 13/	16 inc	h I.D. (SH		FINISH	뉟
							WATER LE	VEL	21,3 FT.	32.0	FT.	- William		7ME 9:45	TIME. 14:45	S
							TIME		13:50	114				DATE	DATE	
N	ORTHI	NG: 1	06770	9.56	Mile Str. Martin data		DATE CASING DI	COTU	10/03/95	7					10/03/95	
DATUM E		G: : E 7:	****	4.56	ELEVATION 484.2		REACE CON		128.0 FT.	36.0	+ 1.1		.1			DRILLING CONTR
	90*	ا بنا		BEARING	NA .	301	REALE, COM	AIRAS		······································	RICUCIA JALAHAMA					힍
SAMPLE		ŧ				1				······································		····				
	<u> </u>	,	Γ	T z	***************************************	<u></u>				7,-41	-	TT	11			Ž
DEPTH IN FEET (ELEVATION)	BLOW 6 N. ON SAUPLER	2	ند ا	SAMPLER SYMBOL	•	***	a të kë asfermin					E		1		
¥¥.	3	RECOVERY	SYMBOL	G ac		A								REMAR	HCS	l E
超	23	百	ঠ	2	DESCRIP	PRUNIT	OF MATTERIA	ă.				MAP LE				
25	""			3								"				ļ
	T	Tası	V V	K 7	(30.0-36.0 ft.) VASTE,	wo.4						T T				
		5.0°	7 0	M	famo_adin Let MyaiEi	, REV	•						31	8 31.2 ft., chunk of	limestone	1 1
— 31		T-36/		H								TZ	= 1	crushed of Shelby Tu		
E			7 7										31	0.0 ppm PI	ם.	TILTON
32	l.,		7 7 7 7	igspace												t
31	10 11 50/3	0.4° 2.0°	7 7	A									31			1 1 1
*	50/3	(SAY)	7 4									SP	=======================================			HARRINGTON CHK'D BY
= -			A A									0	41			HARRIN CKO
= 34		l	D D										ヨ			当ま
	37 29 24	5.0.	7 4	1									=			
35	24 30	(10%)	7 7 7 7	1								SP				
34			V V	4								(18)				
36			7 7						(4	48.2)	36.0		IE			6/6
= 30	i	쌹	Ш	\	(36.0-38.0 ft) Loose, (5Y 4/1), SILT, little	fine	e gray Sand NR						#1	0.0 ppm PI	D	BY 10/9/95
= 37	3	19010		M	moist, (ML), (LDESS)							SP	<u> </u>			,
E 3/	[/\								119	31			125 山
	ļ			Н					(4-	46.2)	38.0		= 1			LOGGEO
38 = 39				_	End of Soil Borehole	Log	at 38.0	ft.					31			
													=			
39	1												31			
E		1	1										31			
40				[= 1			
													E			. .
E- 41			1	1								1	31			
_		l	l										= 1			848
42			ļ									1	3			943-2848 105
41 42 42		1														943 LR105
L - 43	1	1	1	1								1	41] 5
*				1									31			ن نن ا
E 44													ᆿᅵ			JOB NO.: FILENAME:
													크 l			8 9
	<u> </u>	L	<u>L</u>	<u>L</u>								<u> </u>	<u> </u>) ~ ~ ~

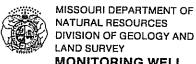
Well No. LR-105

Boring No. X-Ref: LR-105

PIEZOMETER CONSTRUCTION SUMMARY

		Survey Coords: Northing: 1067710 ft. Easting: 514525 ft.	Elevation Ground Level Top of PVC Casing	484.2 ft. NGVD 486.79 ft. NGVD
۰ ۲		Drilling Summary:	Construction Time log:	
4			s s	Start Finish
		Total Depth 38.0 ft,	Task Date	Time Date Time
	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	Borehole Diameter 8 1/4" (0.0-38.0")	Drilling	
	∇	Gasing Stickup neight 2.59 it.	CME 750 10/3/95	9:45 10/3/95 14:45
-10		Driller Layne-Western St. Louis, MO		
	∇	St. Louis, MO	Geophys,Logging:	
	יק	Rig CME 750	Casing:	
	∇	Bit(s) 4 1/4" ID Hollow Stem Auger Bit	2" I.D. PVC 10/3/95	15:00 10/3/95 15:05
	7	7	10000	151050
		Drilling Fluid None	signification control of the control	
-20			Filter Placement: 10/3/95	15:10 10/3/95 16:00
		Protective Casing 8x8" Square Steel, by 5' long	Cementing:	
			Development	
(:::		Well Design & Specifications	Bentonite Grout Bentonite Seal	
			Bentonite Seal 10/3/95	15:00 10/3/95 16:40
-30	1	Basis: Geologic Log X Geophysical Log		
		Casing string(s): C = Casing S = Screen	Well Development	
	= 7 7		was a state of the	
		Depth String(s) Elevation	and the state of t	atily and year and the second
lam.		+2.59 - 26.20 C1 486.79 - 458.00		
······································	Post-opation	<u>26.20 - 36.00 S1 458.00 - 448.20</u>	***************************************	Washington (1997)
		36.00 - 36.30 C2 448.20 - 447.90	***************************************	
			Stabilization Test Data:	
		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
			Time pH Spec	. Cond. Temp (°C)
		Casing: C1 2" dia. Schedule 80 PVC,		
~50		flush threaded with O-rings		
		C2 2" dia. threaded PVC end cap		
		(4" long or 0.33")		
		Screen: S1 2" dla. Schedule 80 PVC, 0.010" machine		
	į	cut slot, flush threaded with O-rings	Projection of the contract of	
		Sand Pack: 16-35 mesh Silica Sand 22.8-36.5'	Recovery Data:	
-60		ORIGITARE. 10"00 HOOF ORIGINATION	ricoovery Data.	
		Pita - Paul Landhan PA was Nillan Oamal		
		Filter Pack: Less than 50 mesh Silica Sand	100	
	ļ	21.8-22.8'	80	
	-	Grout Seal:	8 60 T	
-70		*	WENDY WENDY WARRENCE	
		Bentonite Seal: Extra high yield Wyo-Ben (100%)	30	
		Chips 3.0-21.8'	20	
		Concrete: 0.0-3.0'	0 20 40	60 BO 100
	Marie Control		TIME (Minut	es)
		Comments: Drilled to 36.0' and collected split s		<u></u>
-80		The state of the s	A C C C C C C C C C C C C C C C C C C C	**************************************
			The second secon	Particular and the second seco

	ot to Scole	D. Harriston	1 ASDA ANDERS OF TORAN	
	" (C) DCOM	Supervised by B. Harrington Site	LAIDLAW/OU2 RI-FS/MO R106	



OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145109	
C.A. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED

	MONITO			000	L		PPROVED BY				AOUTE					
			ON REC			1		3Y			ЕНТЕЯ		th.1			
INFOR	MATION SUPPL	IED BY	MONITOR	NG WE	LL CONT							2	11.1	Ph 2	Ph 3	
	DLAW BRIDGE	Toki "	Saklitaev	. 1 A.	inen i	WEL	L NUM		-105							
SITE ADDI	RESS				CITY				,,,,,		\$	TATE		ZIP	CODE	
ST.	CHARLES ROC	k Ro)			BRII	DGC	TUN					Me		63044	
1		5ys	STEMS,	NC.							TI	ELEPH	IONE 314 - 24	<u> </u>	3710	
OWNER A	DDAESS		,		CITY						51	TATE	J14 - 22		CODE	
******	3 N. BROADI ICE □ YES DAT	VA Y			<u> </u>	ST.	Lou				<u>. l</u>		Mo	<u> </u>	63102	
ISSUED	197	NANCE NU	MBER:	*****			SHO	ATION (ION IN	.L	e i i	BEAC	COUN E ELEVATIO		57. 60013 424.2	
DESCRIB	E LOCATION OF TH		V	DE ADIE	TO VIEIT IT		FT	TION PLA	Т		au.	AFAU	EELEVAIIC	JN		
	D'EAST OF W							 	SMALL	EST ¼					LARGEST W	
H	IORTH OF SOI	THME	ST FENCE	CURL	IEZ.			<u> </u>		% .		%			14	
		···		 .			السل	ليلتل	SEC	т	WN	_4	7 N.R	NG		
							LAT.	<u> 38</u> .	45	_ 57			90			
MONIT	ORING WELL IN	STALL	ATION													
CONTR	ACTOR'S NAME		4.10I4	LA	INE WE	STE	εN	Co., 11	NC.		PE		داه	58 WPM		
DRILLII	NG CONTRACT	OR'S		Las	NE WE	: 4 16-	- (1	<u></u>	1			ERMI	т			
1171111					CONST					N	[N	UMB	ER O			
TYPE	MONITORING		TYPE OF	. □ на	ZARDOUS				MC	ONITORING				ALL THAT APPLY)		
WELL	☑ PIEZOMETER ☐ OTHER		POTEN- TIAL SITE			□ 01	THER			l v.o.c. I other		META	us 🗆 P	PETROLEUM PRODUC		
PRO- TECTIVE	LENGTH	DIAMETEI CASING	R OF WEIGHT C	DEPT	TER AND JOI	NTS		☐ THE	LEADED	MATERIA		THER	MO PLASTIC	ONLY DPLASTIC LOCKING CAP?		
CASING DETAILS (IF USED)	5 ғт.	8×8	SIN 0.188		#OLE			r 🗌 MEI	DED	X STEE	L 🗆	FLUO	RO POLYME	R 🗷	YES 🗌 NO	
	CAP VENTED	CASING	MATERIAL.		DEPTH FROM	M THE SU	IRFACE		IZ AI		DE	SCRIBE HOW	- W THE FLUSH MOUNT WAS			
}	☑ YES ☐ NO	GROUT	E CONOR		CASING GRO			SURFACE COMPLE	E	D	CONSTRUCTED					
	I YES □ NO	DATE	OTHER		3.	0	FŦ.	TION	TLJ FL	* 1:3	-					
CENTRALIZ ON RISER	ER USED NO					MATE	_	ESS STEE	· · · · · · · · · · · · · · · · · · ·			7_				
RISER	LENGTH LENGTH	LOCATED	METER OF	WEIGHT		METER O		JOINTS		THR	EADED	- - MA	TERIAL	[]]	ERMO PLASTIC	
PIPE DETAILS	04.0	FT.	EA PIPE	SDA #	1	L HOLE				☐ WEL	DED		STEEL		UORO POLYMER	
 	28.1		2 "		NITE SLURRY	8/4	IN.	MATERIAL		LENGTH OF			DCMT	ONITE SEAL		
ANNULAR SEAL			BAGS			BENT		BENTO		_		SEA		INSTA	LLED IN	
	NON SLURRY TYPE:	BENTONI	, e # BEV	ITONITE U R USED/BA		SE	AL.		JRRY ☐ CHI ANULAR ☐ PEL						NSATURATED ZONE	
PRIMARY	TYPE K SAND		GRAIN SIZE	LENGTH C		METH			Informa	tion in this	FEI	1	15.5	LJ S.	ATURATED ZONE	
FILTER PACK	MANUFACTU	RED	16-35		5,2. FT.	ŀ	LLATIC		column supplied from Su	in the Feel		OM			ATION RIPTION	
SECONDAR	TYPE		GRAIN SIZE	LENGTH C		метно	DD QF	POUE	column						······································	
FILTER	MANUFACTU	RED	حوا	PACK		Ì.	LLATIO			batiom of	İ	ĺ	0.2	Llay	'	
	LENGTH OF SCREE	N C	DIAMETER	SLOT SIZE	WEIGHT OR			Pour	Seni:		3,0	2				
SCREEN	J 10	_	ا م		SDA#	PL ST	ASTIC FEL		Danth to	Base of			2-36	Tra:	sh	
	LENGTH OF SUMP	FT.	2 IN.	IO IMP	MATERIAL	FL	UORO	POLYMER		Seat:	21	8				
SUMP DETAILS					☐ PVC ☐ FLUOR		STEEL		Depih to	Deer of						
<u> </u>	WAS THE WELL BAC	K A	MATERIAL USED		OTHER LENGTH O			<u> </u>	Bentonii		2 i.	8				
BACK FILL	FILLED?				BORE HOL		, I-ICL	:	Depth to Primary	Top of Fifter Pack:	22.	<u>, </u>				
STATIC WAT			MULTIPLE CA	CCD WELL						Top at the				-		
•		FING POIN	T SUBMIT ADD	ITIONAL A	S BUILT DIA	GRAM (SHOWI	NG WELL	Screen;		. ما ان	.3				
	POINT FOR STATIC WAT		CASING, HOLE	DIAMETERS	INCLUDING AND GROUT	TYPE AF	ND SIZ	E OF ALL				l				
☑ TOP OF	RISER PIPE	EN FEARF I	D AIR ROT		AUGER TY	PE 4	/4 F	1,5,A.	Depth to the Scree	Bettem of	34.	. 3	34-35	5.1	+	
	OF MEASURING POINT		REVERS	_	OTHER				Total Depth: 33.0 DATE WELL DRILLING WAS COMPLETED							
	456.74	THE MO	ROTARY	•		7010	- ···	0.00::-					l n	-03	-95	
OFNATUR	TAL RESOURCES	HEUUIH	EMENISFU	R THE C	THE CONSTRUCTION OF MONITORIN			CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT ITORING WELLS.								
SIGNATURE	PRIMARY CONTRACTOR				DATE SIGNATURE DRILLER/PERMIT #				 1		********	- 1	ATE			
- (*) かんしゅ MiD 780-1415 (7	11 21 - 11 a price	Y /	RIBUTION: W	HITE(DIVIS		(6)m	(m. st)	Mak	urin	}.	1451			H-15-7-5		

B MCACHELANIS

	4		-		LAW BYRTEMS INC.		SOI	L B	OF	RE	HO	LE	LOG		
SITE NAM				ADIE (DISIEMS INV.	DR	LLING METHOD			**************************************		······································	BOKING I		
							6.25 (nch I.D. i	Hallow	Ster	Auge	r	PZ-1	07-SS	
, ' 													SHEET		₂
						SM	MPLING METHO	O:		···			1 0	y r 3	AYNE-VESTERN
		LA	IDLAV	//OU2	RI-FS/MO	SI	PLIT SPOON	2.0 inch	O.D./1.	5 inc	h [.D.	(SP)	DRIL	LING	VE
			EST L	AKE I	ANDFILL UNIT 2	 	HELBY TUBE	3.0 inch	O.D./2	13/	l6 incl	1.D. (SH		FINISH	岁
			UFER	70LL	CHAT1 E	WA	TER LEVEL		ļ	_		<u> </u>	TIME	TIME	Į Š
						ļ	TIME						13:00	16:25]
t	NORTHI	NG	106716	3.45			DATE		<u> </u>	_			DATE 3/26/95	3/26/95	
DATUM 8				52	ELEVATION 462.6		SING DEPTH		<u> </u>				3, 50, 70	3,667,73	CONTR
DRXLL RX		E 7:		EARIN		SURFAC	E CONDITIONS					· · · · · · · · · · · · · · · · · · ·		Compagn of Compagn	ģ
SAMPLE				*AUR		<u> </u>	·	,	······································	······································			······································	······································	1 1
SAMP CE.	T PHARE.	<u>.</u>		T		1					Т		······································		2
DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SMBOL.	SAMPLER STABOL		MPLE NUMB AND PTION OF I					SAMPLER TIPE		REMA	RKS	DRILLING
	3 5 5	0.9° 2.0°		H	(0.0-2.0 ft.) Stiff, mo brown (10YR 5/4), SIL very fine Sand, VR, o	TY CLAY	, trace of	•			SP				
1 2 3 4 5	5				The y time develop way		.,				0	員			HERST
2	2	١.,,		\vdash	(2.8-4.0 ft.) Firm, yell	inwish br	ຕວພກ				\vdash	31			-
Ę	21 22 4	5.07) 5.0,		M	(10YR 5/4), SILTY CLA	AY, little	Gravel,								
3	18				damp, (CL), (FILL)	731. O. F	in crain, with				SP				<u>}</u>
				1							2	31			불물
- 4	_			1	(4.0-6.0 ft.) Very st	the made	ven limbat				-				l 의 공
E	8	2.0°		M	gray (N5) to dark g (56Y 4/1), SILTY CLAY	reenish	gray					31			vi
5	11 10	K334.			moist, (CL), (FILL)	1, 50me	dugaer out				SP				
E				1							3	3			
- 6			<i>}</i>		(6.0-8.0 ft.) Mixed da	mo wast	n and Eltu		56.6)	6.0	-	4			7 7 6/1/95
-	9	滤	7 7 7 7	M	clay	onp name	w with sarry					31			€ ≅
_ 7	8 23 5	K32*		7							SP			Ē	e
E			▽ ∇	1							0	31			LOGGED
– 8			7 7		(MA 184 54 1 T)-										9 8
E	7 2 4	0.3° 0.5%	7 7	A	(8.0-10.0 ft.) Trash										1
_ 9	1	0.527	77	1							SP				
F		Į	∇	1							[3]	= 1			and and and and and and and and and and
E 10			▽ ▽												
= '0	3 4	0.0°	77	1	(10.0-12.0 ft.) Waste	pecomes	: wet				1 1	= 1			1
F	4	(02)	7 7	1							SP				
11]		V V	4							6	31			
-		}	▽ ∇∇					(4	150.6)	12.0	1 1		From 12.0	-58U £+	943-2848 1075S
<u> 12</u>	8	5.0°			(12.0-14.0 Ft.) No Rec	overy					\prod	目目	no sample	5	43-
F	8 32 15 9	(0%)									SP	∃	necovene drilling inc	dicated	943-2
13	٦		RECOVERY								10	크	mixed was sity clay		ı
Ē			23]	,,	- "	0 ¥
7 8 9 10 11 12 13 14	6	0.0		H	(14.0-15.0 Ft.) No Rec	covery					SP	=			JOB NO.:
E	6 12 8	(0%) (0.0)									10				

	4	G AID	A		D/A/AV		SOI	L B	ORE	HC)LE	LOG			erith range 11
SITE NAM	-	-	- Children Control		41912-09170		DRULLING METHOD);		******************	***************************************	BORING N			. 1,49
							6.25 (nch I.D. H	Hallow St	en Auge	r	PZ-1	07-SS]	
1												SHEET		2	
							SAMPLING METHO	: 				2 c	¥7 3	LAYNE-VESTERN	-
		L.A	IDLA	//DU	12 RI-FS/MO	I	SPLIT SPOON:						LNG	Ž	
					I LANDFILL I UNIT 2		SHELBY TUBE	: 3.0 inch	0.0./2 13	1/16 inc	h I.D. (SH)		FINISH	, R	1
				noce	- W1747 III		WATER LEVEL		ļ			TIME	TIME	Γ¥	
							THE		 			13:00 DATE	16:25 DATE		1
	ORTHI	NG: 1	106716	3.45			CASING DEPTH	 	 			_	3/26/95		
DATUM E		G: 51 E 75		52	ELEVATION 462.6		RFACE CONDITIONS	<u></u>	[<u> </u>				Ė	
ANGLE		- 1		BEAR	NG .	301	THE CHURKINS			· ····································	· · · · · · · · · · · · · · · · · · ·		······································	CONTR	Į
SAMPLE		······										· · · · · · · · · · · · · · · · · · ·	·	1	
·	T			4	Military			······	· · · · · · · · · · · · · · · · · · ·	1				DRILLING	ļ
DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	Æ	ر ا	SAUPLER SYMBOL	¢11 m	~ ~	is to be desired			E					-
₹	3	RECOVERY	SYMBOL.	8	2748	AN	NLAMBER ID OF MATERIAL					REMA	ecs 200	꿈	
間	93	盔	G	7	(ACSCION)	(PLATE	OF MICEINA	-		SAMPLER	11				
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	T			П	(15.0-16.0 ft.) No Reco	ver	v			92				1	
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<u>=</u> 18	5	0.00		\vdash	(18.0-20.0 ft.) No Reco	ver	·v			\vdash					<u>a</u>
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21	3		ECOVERY							42					6/1/13
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E	4	0.0° 2.0°			<u> </u>		•				31			LOGGED	DATE
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25	ίο	(02)								SP					
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E 26	_			H	(26.0-28.0 ft) Waste						-31				[
E	5 5	0.4° 2.0°			(26.0-28.0 ft) Waste						=			8	
E 27	5 5 9 12	(20%)								42 (三三			943-2848	S
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				}	(28.0-32.0 Ft.) Stiff, of (5GY 4/1), SILTY CLAY,	dar , NR	(greenish gra: ', wet, (CL),	Y			= = 1				ដំ
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							6.25	nch I.D.	Hollow St	en Aug	er	-	07-SS	
									- Indiana			SHEET		Z.
							SAMPLING METHO						yF ³	LAYNE-VESTERN
					RI-FS/MD		SPLIT SPOON				Mariab)		LING	Š
		W			ANDFILL UNIT 2		SHELBY TUBE	: 3.0 inch	O.D./2 13	/16 inc	th [.D. (SH)		FINISH	Ä
			H1 H-01	13,160	J141. C		WATER LEVEL					TRACE	TIME	Ť
							TIME	<u> </u>				13:00	16:25	
N	ORTHI	NG:	106716	3.45			DATE		<u> </u>			0ATE	DATE 3/26/95	
ATUM E	7-1-1-2-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-			52	ELEVATION 462.6	1	CASING DEPTH	L	<u> </u>			37.507.3	3,50,33	CONTR
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NGLE -				EARTHG		╀─					<u> </u>			Ī
SAMPLE !	HAMME	₹	r	····						<u> </u>		,		DRILLING
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#¥	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SMBOL	ij	DESCRIP	A NOTE	nd of Material			SAMPLER		MC1464	nv.	
DEPTH IN FEET (ELEVATION)	젊종	₽ .) "	SAMPLER STABOL						₹				
				47			······································							
]	<u> </u>	777		(28.0-32.0 ft) Stiff,	dar	k greenish gray				ГЭГ			
•					(5GY 4/1), SILTY CLAY	Y, N	₹, wet, (CL),				=			
- 31					1. W. 22 /						-]			
•		1]]			
- 32	1	1	777		F-2 - 6 May 5	1		(4	30.6) 38	.0				
- 32					End of Soil Borehole									
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RECORD OF DRILLHOLE PZ-107-SS Sheet 1 of PROJECT: LAIDLAW/FI-FS BORING METHOD: NX Core & water COLLAR ELEV: 482.8 DATUM: MSL COORDINATES N: AZIMUTH: 0 PROJECT NO: 943-2848 DRILLING DATE: 5/21/95 - 5/22/95 1087183,45 E: 515254.52 INCLINATION: -80 LOCATION: BRIDGETON, MO ORILL RIG: CME 75 J-Joint F-Fault S-Shear B-Bedding F-Foliation Fe-FeOxide CL-Clay Infili CH-Chiomie Pt. Planar C-Curved U-Undutating P-Polished K-Silkensided SM-Smooth WEATHERING INDEX OFIENTATION POINT LOAD STRENGTH INDEX (psi) NDEX 2 ST-Stepped I-Irregular R-Rough VR-V. Rough H-Healed GRF-Gravel Filled DEP1, (PEET) NOTES GRAPHIC WATER LEVELS DESCRIPTION MINUTTY DATA INSTRUMENTATION FRACTURE PER FOOT ELEV CONE CONE AXIS ROD TYPE AND NE NE DEPTH SURFACE DESCRIPTION (FT) | BEEVEERV 2222 8 8 49 0.0-32.0 ft. See Soil Borehole Log PZ-107-SS 5/18/95 - 5/19/95 A 9 7/8 in. borehole (air notary) was advanced through 10 1/4 in. IO hollow stem augers from 30.0-55.0 ft., and 6 in. steel was sealed in borehole from surface to 55.0 ft. with neat 32.0-54.0 ft. No samples collected 55.0 ft. with neat cement. Bedrock was encountered at 51,0 ft. 50 **BGS** during drilling 52 54 54.0-59.0 ft 5/21/95 @ 15:30 54,0-35.0 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), ft. or grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Began coring 56 J,PL,SM,CL 1 58 J,PL,SM 5/21/95 @ 15:50 59.0-63.5 ft. 59.0-63.5 ft.
Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 60.0 ft. J,PL,A 60 B.PL.SM Fossiliterous J.PL.SM.CL 2 J,PL,R 62 63.5-82,3 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION) B.PL.SM 84 DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN LOGGED: D. ALLOWAY CHECKED: B. TILTON **Golder Associates** DRILLER: D. MAHURIN DATE: 6/20/95

RECORD OF DRILLHOLE PZ-107-SS Sheet 2 of PROJECT: LAIDLAW/RI-FB BORING METHOD: NX Core & water COLLAR ELEV: 482.8 DATUM: MSL E: 515254.52 INCLINATION: 490 PROJECT NO: 943-2848 LOCATION: BRIDGETON, MO DRILLING DATE: 5/21/95 - 5/22/95 DRILL RIG: CME 75 COORDINATES N: AZIMUTH: 0 1067183.45 Fe-FeOroda CL-Clay Infe CH-Chlorida H-Flesied GRF-Cravel Filed J-Joint F-Faun S-Shear B-Bedding F-Folston PL-Planar P-Polished K-Sikerwided SM-Smooth WEATHERING INDEX C-Curved U-Undulating POINT LOAD DEPTH SCALE (FEET) STRENGTH 2 ST-Stepped I-Irregular R-Rough VR-V. Rough NOTES GHAPMIC WATER LEVELS ATAC YTIUNITY DESCRIPTION INSTRUMENTATION 2 ELEV GRAPHIC OP MAT COORE AXIS TYPE AND SURFACE DESCRIPTION ROD DEPTH ACN. 355 355 350 350 350 (FT) 332 2222 E2222 유유무유 44025 8 8 63,5-82.3 ft. 50,5-62.5 it. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION) B,PL,SM B,PL,SM,CL 64.3 ft. Argillaceous layers common, stylolites common 2 J,PL,SM J,PL,SM,CL 68 J.PL,SM,CL 5/21/95 @ 16:15 End of Run 2 383.60 69.00 J,PL,A 70 B,PL,SM,CL (5) 72.1-72.6 ft. Argillaceous layer B,PL,SM,CL J,Į,R 3 B,PL,SM,CL 76.7-77.2 ft. Argillaceous layer 78 78.4·79.9 ft. J,PL,SM (2) 5/21/95 @ 17:40 End of Run 3 Argillaceous layer 00 4 J,PL,SM 80 DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN LOGGED: D. ALLOWAY CHECKED: B. TILTON **Golder Associates** DRILLER; D. MAHURIN DATE: 6/20/95

RECORD OF DRILLHOLE PZ-107-SS Sheet 3 of 4 PROJECT: LAIDLAW/RI-FS PROJECT NO: 943-2848 SORING METHOD: NX Core & water DATUM: MSL COLLAR ELEV: 482.8 DRILLING DATE: 5 DRILL RIG: CME 75 5/21/95 - 5/22/95 COORDINATES N: 1087183.45 E: 515254.52 INCLINATION: -90 LOCATION: BRIDGETON, MO AZIMUTH: 0 Fe-FeOxide GL-Clay inte CH-Chlorite H-Healed GRF-Grayel Filed P-Polished K-Sätensided Pl. Planar F-Fault S-Shear S-Bedding C-Curved U-Undutating ORIENTATION POINT LOAD STRENGTH SM-Smooth (SC) O. ST-Stepped I-irregular A-Rough VR-V. Rough F-Foliation NOTES INDEX (GRAPHIC WATER LEVELS DESCRIPTION TNUITY DATA INSTRUMENTATION ELEV 30 DIP WIT CORE 80 AXIS ROD DEPTH NO. 8 2 8 8 8 8 SURFACE DESCRIPTION 38 (F1) 334\222\22222 8848 60 63.5-62.3 ft. bashasa in Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), m-c grained, medium strong LIMESTONE, (ST. LOUIS FORMATION) J.PL,SM (3) J.PL,SM (2) 82 82.3-84.6 ft. Slightly weathered, medium bedded, light olive gray (5Y 5/2), medium grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 84 100 84.6-88.5 ft. Fresh, medium bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) Thinly laminated Clay layers abundant 80 J,PL,SM,CL (2) J,C,SM 88 88.5-94.1 ft. 5/21/95 @ 18:40 End of Flun 4 Quit drilling for 86.5-94.1 ft.
Fresh, medium bedded, light olive gray (SY 5/2), fine grained, medium strong, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION)
Stylollize shundru the day 5/22/95 @ 7:30 Began drilling Stylolites abundant 90 92 100 % 94.1-97.2 ft.
Fresh, thinly bedded, pale yellowish brown (10YR 6/2), fine grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION).
Abundant thinly laminated Clay B,PL,SM,CL (3) 96 DEPTH SCALE: 1:2 LOGGED: D. ALLOWAY CHECKED: B. TILTON DAILLING CONTRACTOR: LAYNE-WESTERN Golder Associates DRILLER: D. MAHURIN DATE: 6/20/95

RECORD OF DRILLHOLE PZ-107-SS Sheet 4 of PROJECT: LAIDLAW/RI-FS PROJECT NO: 843-2848 LOCATION: BRIDGETON, MO BORING METHOD: NX Core & water DATUM: MSL COLLAR ELEV: 482.8 E: 515254.52 DRILLING DATE: S DRILL RIG: CME 75 5/21/95 - 5/22/95 COORDINATES N: 1087163.45 AZIMUTH: 0 INCLINATION: -BO J-Joint F-Fault 6-Shear B-Badding P-Polished K-Sikunsided SM-Smooth Fe-FeOxida CL-Clay Infa CH-Chlorite PL Paner l m C-Curved U-Undutating STRENGTH POINT LOAD INDEX (psi) GRAPHIC LOG R-Rough VR-V. Rough ST-Stepped ⊩irreor tar GRF-Gravel Filed NOTES DEPTH DESCRIPTION WATER LEVELS INUITY DATA INSTRUMENTATION ALIR NO. ELEV CORE ROD TYPE AND SURFACE DEPTH GAAPE (FT) DESCRIPTION 8888 9 9 94,1-97.2 ft.
Fresh, thinly bedded, pale
yellowish brown (10YR 6/2),
fine grained, medium strong,
LIMESTONE,(ST. LOUIS
FORMATION)
Abundant thinly laminated Clay B,PL,SM layers 5 layers
97.2-100.7 ft.
Slightly weathered, medium
bedded, light olive gray (5Y
5/2), fine to medium grained,
medium strong, ARGILLACEOUS
LIMESTONE, (ST. LOUIS
FORMATION)
Calcite filled healed
fractures common SR 5/22/95 @ 8:10 End of Run 5 363,60 99.00 100 J.PLR.CL 100.7-104.0 ft. Fresh, thinly bedded, pale yellowish brown (10YR 6/2), f-m grained, medium strong, LIMESTONE, (ST. LOUIS FORMATION) 100 6 J.PL.R Abundant thinly laminated clay 102 layers J,PL,R J,PL,R 5/22/95 @ 8:30 Finished coring 358.60 End of Record of Borehole 104.00 at 104.0 ft. 106 108 110 - 112 DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN LOGGED: D. ALLOWAY CHECKED: B. TILTON **Golder Associates** DRILLER: D. MAHURIN DATE: 6/20/95

Well No. PZ-107-88

Boring No. X-Ref: PZ-107-SS PIEZOMETER CONSTRUCTION SUMMARY

		PIEZOMETER CONST	RUCTION SUMMARY	
· .	 ij	Survey Coords: Northing: 1987183 ft.	Elevation Ground Level	462.6 ft. NGVD
	IJ	Easting: 515266 ft.	Top of PVC Casing	464.66 ft. NGVD
		Drilling Summary:	Construction Time log:	F=0
- Initia		Total Depth 103.0 ft.	Task Date	tart Finish Time Date Time
		Borehole Diameter 14 1/4 in. (0.0-32.0 it.) 5 7/8 in. (32.0-103.0 it.) Casing Stickup Height 2.03 ft.	Drilling CME 75 (augers) 3/28/95	13:00 3/26/95 16:25
		Driller Layne-Western	CME 75 (core) 5/21/95	15:30 5/22/95 8:30
-15	8 :11\/	St. Louis, MO	Schramm Rotary 5/22/95	11:00 5/22/95 11:30
	N I S		Geophys.Logging:	
	81 I A	Rig CME 75, Schramm Portadrill T660H	Casing:	
		Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core, 5 7/8 in. Button Bit for Reaming	2" PVC 5/22/95	11:30 5/22/95 11:35
		Drilling Fluid Auger-None, NX Core Water,	6" Steel 5/18/95	9:00 5/18/95 14:00
-30	B1 [/	Air and Mud Rotary	Filter Placement: 5/22/95	11:40 5/22/95 11:55
		Protective Casing 8x8 in. Square Steel, by 5 ft. long	Cementing:	
			Development	
		Well Design & Specifications	Bentonite Grout 5/22/95	12:10 5/22/95 12:45
			Bentonite Seal 5/22/95	11:55 5/22/95 12:10
-45	SAM			
	95	Casing string(s): C = Casing S = Screen	Well Development	11.00
	NO SAMPLES //	Depth String(s) Elevation		
		+ 2.03 - 92.60 C1 464.86 - 370.03		
		92.60 - 102.40 S1 370.03 - 360.23		
, 🔯	図目	102.40 - 102.73 C2 360.23 - 359.90		
		+1.00 - 55.00 C3 463.60 - 407.63		
			Stabilization Test Data:	
			T 1 -(1 C	O T (30)
		Casing: C1 2 in. dia. Schedule 80 PVC,	Time pH Spec	. Cond. Temp (°C)
1	図田	flush threaded with O-rings		
→ 75		C2 2 in. dia. threaded PVC end cap		
		(4 in. long or 0.33 ft.) (C3-see comments)		
1.5		Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.		
		machine cut slot, flush threaded with		
		O-rings Sand Pack: 16-35 mesh Silica Sand, 90.4-103.0 ft.	Recovery Data:	
-90 🖾		Sanc Fack. 10-05 mean onice Senty 30.4-100.0 k.	necovery Bata.	
		Filter Pack: Less than 50 mesh Silica Sand,		
		89.0-90.4 ft.	100	
=		Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,	80	
			8EC0450	
-105		3.0-78.0 ft.		
1		Bentonite Seal: Extra high yield Wyo-Ben (100%)	30 20	
1	,	Siurry, 78.0–89.0 ft.	10	
į		Concrete: 0.0–3.0 ft.	0 20 +0	60 80 100
W-			TIME (Minu	es)
-1,20	Passage of different	Comments: Surface Casing C3: 6 1/8 ID / 6 5/8	in. OD Steel Casing	
1-1,20				
Ĺ	***************************************			
			1 2 2 3 3 1 4 4 4 7 5 m 1 5 m	
Not to	Scale	Supervised by B. Tilton Site Job Number 943–2848 File Name	LAIDLAW/OU2 RI-FS/MO PZ107SS	



MISSOURI DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGY AND
LAND SURVEY

OFFICE USE ONLY	DATE RECEIVED							
nef No 122508	CHECK NO.		******					
ROUTE	TRANSMITTAL NO							
STATE WELL NUMBER	CROSS REFERENCE NO	0						
CHECKED BY	ENTERED							
	Phi	Ph 2	Pn 3					
APPROVED BY	DATE APPROVED							

CHILD SOLIATI	}-		·····		_							
MONITORING WELL		CHECKED BY		ENTERED Ph 1 Ph 2 Ph 3								
CERTIFICATION RECORD		APPROVED BY		DATE AP								
INFORMATION SUPPLIED BY OWNER												
SITE NAME			WELL NUMBER		···							
i	LANDF	144	PZ-16	755								
SITE ADDRESS	CITY				STATE	ZIP CODE						
OF CHARLES CORE RD		BRIDGE	トレント		Mo	63044						
NAME					TELEPHONE	-1,						
LAIDLAW WASTE DYSTEMD, IN	C .				314- 3H	1- 3710						
ADDRESS	CITY				STATE	ZIP CODE						
1636 N. ORUANUAY		3T. LUU	15		Mu	63163						
INFORMATION SUPPLIED BY MONITORING WEL	L CONT											
LOCATION OF WELL COUNTY 3	t. لبدي	SKETC	H THE LOCATION T	O THE WELL	. INCLUDING MILEA	GE ON ALL ROADS TRAVELED						
SHOW LOCATION IN SECTION PLAT ELEVATION	450.6	- FAUM	teknesi iliwins bi	TAWHUSH :	1	\$ 10 m						
AREA NO				&)	Ysite W							
TTTT SMALLEST N	LARGEST			•	ا علا (اع	4.7. A						
L. T. T. T.	EARGEST	**			의 .	Χę						
 		_'4			퉤)	1/2						
SEC TWN:4/7 N,RNG:	_5_	E3HW		") P								
LAT. 30 . 45. 53. LONG 12 . 14				F/4 /								
					- 4							
DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE	TO VISIT I	IŦ				INSTALLATION						
				CONTRACTOR'S NAME								
			***************************************	LAYME WESTERN CLINX.								
	(***		DRILLING CONTRACTOR'S								
NOTE: Record the fraction of a foot				DRILLING CONTRACTOR'S								
in decimal, not in sinches.		CKING CAP - Y										
Top of Riser Elevation:		P VEHT - Y / N)C: OTECTIVE CASING		LAY.	NE WESTE	ERN Co, INC.						
464.7	Тур	×: 3⊺€€∟		TYPE OF	INSTALLATION	•						
11 11	500	® 5"×5"×5	s'	X ABO	OVE GROUND	☐ FLUSH MOUNT						
Ground //J./ Feet from Description of	Bor	e Hole Diameter: (91/3°	STATIC WATER LEVEL								
The state of the s	WE	EP HOLE - Y / Ñ)(Circle one)	FEET FROM MEASURING POINT								
Information in this column to												
be supplied in				DATE OF	STATIC WATER LEVI	EL '						
the Feet from Clay				5,5,,,,,,								
		PROTECTIVE C		ELEVATIE	ON OF MEASURING P	464.7						
	5=1	Type: 🔁 Conce	at Slurry	MEASURI	ING POINT IS	707./						
Depih to bottom of Protective		RISER PIPE	l	☑ TOP OF RISER PIPE								
ol Protective Casing Seal: 3.0		Length: 34.		OTH	HER							
		Diameter: 3			EQUIPMENT							
3.38		Type of Meterial	: SCH, Bu PVC	. 🖾 AIR	ROTARY 🖪	AUGER TYPE 6/4 4/5/1						
Trush		BOREHOLE	c 7/-			TYPE 6/4 4.3.1%						
20.57		DIAMETER:	<u>.578 m</u>	☐ REV	_	OTUED						
		ANNULAR SEAL	I			OTHER						
shit simplest		Type: 🖫 Bentonii		CENTRAL VES.	JZERS USED 4	10TAL						
54.1.3		Non Stu	rry Bentante		STAINLESS STEEL	4:						
1 traine time		BENTORITE SEA			OTHER							
Depth to Base of Annular Seat: 78.0		Type: ☐ Bentoni ☐ Non Sk	te Slurry ary Bentontie	□ NO								
		Length of Seat	// FL	MULTIPLE	E CASED WELLS	•						
		SECONDARY FIL	TER PACK	SUBM	IT ADDITIONAL	AS BUILT DIAGRAM						
Depth to Base of Bertanita Seat 89.0		Type: 🛛 Sand	(Optional)	SHOW	ING WELL CON	ISTRUCTION DETAILS						
Depth to Base		☐ Manula Greso Stre:) SIZE OF ALL CASING, ID GROUT USED.						
of Secondary Filter Pack: 40.4		Length:	1.47									
Depth to Tep		PRIMARY FILTE	R PACK	DATE WE	LL CONSTRUCTION							
of the Screen 13.4		Type: Sand		1=	5-22-9							
		☐ Manufa	dured	HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN								
		Length:	12.6	ACCORDANCE WITH THE DEPARTMENT OF NAT- URAL RESOURCES REQUIREMENTS FOR THE								
		WELL SCREEN			RESOURCES REC RUCTION OF MON							
Depth te Battem of		Longth: 10		L	RE (MONITORING WE							
Depth te Battem of the Screen: 127 Ls		Slot Size: U.			Nichael							
		SUMP DETAILS	ے اوالہ دیاتے ۔	PERMIT N	,	DATE						
		Length: U.ft	.	001256WM 6-02-95								
Plug Back Total Depth		Diameter: 21		SIGNATURE IDRILLING CONTRACTOR								
Original	_	Type: AVC		Michael P. Vecil								
Total Depth: 103.0		TYPE OF BACKE	TLL: SILAID	PERMIT NUMBER DATE								
				1 100	125/-WW	6.113.445						

	4	A íDi	AZ	4	SYSTEMS INC.		S01	L E	OR	Eŀ	10	LE	LOG		
SITE NA				. 10 12			DRILLING METHOD	<u> </u>					BORING N	Ю.	
(6,25 (nch I.D.	Hollow S	Stem	Auger	•	PZ-2	05-AS	
ŧ													SHEET		Z
							SAMPLING METHO	0:					1 ' 6	F ⁴	LAYNE -VESTERN
		1.4	l ni A	wynus	RI-FS/MD		SPLIT SPOON:	20 inch	D.D./1.5	inch	(,D, (SP)	DRd	LING	KES
		W	EST	LAKE	LANDFILL		SHELBY TUBE	3.0 Inch	0.0./2	13/16	inch	I.D. (S)) START	FINISH	¥
			UPEK	ABLE	UNIT 2		WATER LEVEL					<u></u>	TIME	THE	YA.
							THE					<u> </u>	16:35	11:00	"
	NORTHI	NGe	10674	63.60			DATE					<u> </u>	DATE	DATE	
DATUM	MITZAS	G: 5	15463	1,34	ELEVATION 459.3	·	CASING DEPTH					<u></u>	3/25/35	3/25/95	[E
DRILL RI		E 7:			TAUDH	SL	JRFACE CONDITIONS								CONTR
ANGLE				BEARIN	0	╄	×3					·			1
SAMPLE	HAMME	Rt T	т			<u></u>									일
DEPTH IN FEET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SWBOL.	SAMPLER STABOL		A	NAMBER HD OF MATERIAL				SAMPLER TIPE		REMAI	aks	DRILLING
1	4 7 7 10	1.5° 2.0° (75%)		M	(0.0-2.2 ft.) Stiff, di (557 4/1) to alive gr CLAY, trace fine San (FILL)	ray	(5Y 6/1), SILTY			1	92				HERSI
3 4 5	- WW4	0.5° 2.0° (25%)			(2.2-6.0 ft.) Soft, bl SILT, trace fine Sam (CL-ML), (FILL)			······································	\$57.1>		SP (S)				BY k
E 4 E 5	ជាមិន	1.5° 2.0° (75%)									3 3		Soil becom 8 4.0 ft.	es wet	s. cnsin
J	1443	(5X)		7	(6.0-12.0 ft.) Mixed w sat	et w	waste and claye		53.3)		SP 4				LOGGED BY
8 9 10 11	6564	0.1° 2.8° (5%)	∇ 7 ∇ 7 ∇ 7		(8.0-10.0 ft.) Mixed wo	et w	vaste and claye	у			SP (Ē)				LOGC
= 10 = 11	ลอกว	(30%) 5'0, 0'6,	7	M											
12	កលសក	0.0° 2.6°	7 7	1	(12.0-14.0 ft.) No Rec	OVE	ry	(4	47.3)		SP (7)		From 12.0- no sample recovered drilling ind mixed was	s i, but licated te and	943-2848 PZ205AS
E 14	688	020 5.0 0.0.			(14,0-15,0 ft.) No Rec	COve	ry				SP (8)		silty clay	layers	JOB NO.: FILENAME:

		4				DISAW		SOI		BOR	EHO)LE	LO	G		1	-
SITE	WHE A				Mai	TE SYSTEMS INC.		DRILLING METHOD					BOR				-
•								6.25 ir	nch I.D	2 wallah	ten Aug	er)5-AS		ĺ
1													SHEE			Z	1
								SAMPLING METHO		······································	·				F 4	LAYNE-VESTERN	
						JU2 RI-FS/MO		SPLIT SPOON:						DRIL		¥	İ
			W	EST ! OPFR	LAK ABI	E LANDFILL E UNIT 2		SHELBY TUBE	3.0 ind	th 0.0./2	13/16 inc	n I.D. (SI	H) STAF	-	Finish Time	빌	***************************************
								WATER LEVEL					160		11:00	Š	-
								DATE		_	 		DAT		DATE		1
	NOR	THI	۱G: ۱	0674	63.6	60		CASING DEPTH					_ {		3/25/95	~	1
DRILL	RIG			***************************************	**********	ELEVATION 459.3 CK MOUNT	81	RFACE CONDITIONS	<u> </u>							DRILLING CONTR.	
	-90	****				RING	 ~	MANUEL CONTORNAL								g	-
····	LE HAN			**********		The state of the s	Γ				• • • • • • • • • • • • • • • • • • •					()	
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DEPTH IN FEET	€ 3	ON SWIPER	¥		CAUDI CO SYLIDO	<u></u>		4 10 14 100.000			SAMPLES TYPE					I≢	
Z			RECOVERY	STABOL.	1 0	n sa K namana		NUMBER NO OF MATERIAL			5		R	FAME	KS	当	
E	3 5	Ž.	Æ	ÌĀ	1 2		'IIUN	OF MAIERIAL			1 5		Į				
8	- "				1	.					6			_		[
					_	(15.0-16.0 ft.) No Rec	***************************************									1	
111111111111111111111111111111111111111	1					(13.0-16.0 Ft.) NO KPC	aver	-у			92					1 1	******
-10	6 _					(16.0-18.0 Ft.) No Rec	~				<u>®</u>		1			1 _	1
	5 5 5 4		3.0°			(15.0-15.0 Ft.) NO REC	r) v er	y								V I#PR	1
E_1;	7 15		(0%)								SP		1] =	١
	'										(9)	=				-	•
												三	1			≧	ō
E '	5 5		0.0° 2.0°		П	(18.0-20.0 ft.) No Rec	CVE	ry								₽ 5	ح
F .	5215		(92)								SP					CIISIII	ξ
E 19	9										(0)		1			νi	١
= _																	Į
E 20	ן מ		5.0°	}		(20.0-22.0 ft.) No Red	cove	ry									
	233		(DX3)		l						SP					E	:[
2	1 3			OVERY							(1)					¥	اَۃ
E				À								3				1	
2	2 3		3.0	RECC		(22.0-24.0 ft.) No Red	cove	ry			ļ						
E	3 1 1		60X) 5'0, 0'0,	문							SP	l E	1			LOGGED	Ξ
2	3 4			İ							(E)						1
		i	ŀ]									1				
2	4 ,		0.0-		-	(24.0-26.0 ft.) No Rei	COVE	ery									
E	ĬŽ.	3	5.0° 0.0°					•				=					
E 2	5 50	0/14									42 (13)	=				}	
2	6					(26.0-28.0 ft.) No Re	ند ر روش دام	rev.			<u> </u>	mulmulmin					-
E	9 6 8		5.0°	İ		ן עבמיט־במיט גניז ואס צפי	COVE	er-y			ŀ					æ	Į
E_2	7 10	}	(02)								q2					88 2	,
F											[0]					943-2848 PZ20545	,
= 2 = 2	ا ۾									(431.3) <u>(</u>	8.0] =	1			, , 22	
: 2	و ا		<u>5.0,</u>	Ш	Γ	(28.0-30.0 ft.) Loose, (5GY 4/1), SANDY SIL			У		T		1			l '.	3
	4		(02)								SP	=				S	FILENAME:
E 2	a ,		1								(15)]			JOB NO.:	4
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SITE NAM					y a sa a sayessay 159 Ws		ORBILLING METHOD		V-V-2		····	·····	BORING N	o. —	-	
							6.25 i	nch I.D. H	iollow	Ste	m Auger		PZ-20)5-AS		
											.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		SHEET		Z	
							SAMPLING METHO	0:			***************************************] 3 o	F 4]	LAYNE-VESTERN	
			יא אי	, 4m1 +m	ns . E é zum		SPLIT SPOON	2.0 inch	O.D./1.	5 in	ch [.D. (\$ P }	DRILL	JNG	S	
		W	EST L	AKE I	RI-F\$/MO LANDFILL		SHELBY TUBE	3.0 inch	0.0.72	13	/16 inch	I.D. (SH	START	FINISH	1	
			OPERA	ABLE	UNIT 2		WATER LEVEL				-		TIME	TIME	A N	
							TIME	***************************************				l l	16:35	11:00		
							DATE				· · · · · · · · · · · · · · · · · · ·		DATE	DATE		
DATUM E	ORTHU ASTIN				ELEVATION 459.3		CASING DEPTH						3/25/95	3/25/95	œ	
DRILL RK	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	***************************************		***************************************	MOUNT	SU	RFACE CONDITIONS								CONTR	
ANGLE -	90*		Ę	EARIN	ì										\mathcal{Z}	
SAMPLE	MMMER	.								· · ·						
1				ಶ											DRILLING	
DEPTH IN FEET (FLEWATION)	BLOW/ 6 IN.	¥	,	SMEC	SA	MPLE	NUMBER				볼	[]		[₹	
**	3	RECOVERY	SYMBOL.			A	ND OF MATERIAL				5		REMAR	KS	Ö	
	28	8	G	SAMPLER			- 1-2) (1-3 m				SAMPLER					
. a				ð			·		···							
	T			·	(30.0-31.0 ft.) No sam	ples	collected	****			TT		5/21/95, 1	n.o. :-		
_					1 mark 0110 1 mm 1 mm 3 mm	. part 2	40116 6 10 10					41	ID steel c	asing	١	
<u> </u>			~~	<u> </u>	(31.0-36.5 Ft.) Stiff,	mark	um dark oray	(48	28.3)	31.	4	_	installed to 10.25 in 10.	augers	l	
E	6 5 5	1.2"		M	(N4), SILTY CLAY, with	h th	in Fine sand					∃	to 29.0 ft Casing sea			HFRST
32	5 8	(68%)		П	layers (1° thick), moi (ALLUVIUM)	5T, 1	AK, (CE),				SP		borehole (with neat	}	= >
=											(6)	= 1	cement gr surface.	סס זעם		3
_ 33				Ц								크니			1	¥
= 33	9	1.3' 2.0'		M								=				Ç
= .	3 5 12	KEEKS		H							SP	= 1			CDSIII	CHKT
34	112										107				vi	Ų.
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35	7	1.0*		1								7			1	
Ξ	7	(20%)		N							SP	31				£
36	9			H							<u>1</u> 18	31				6/1/95
				!	(36.5-39.0 ft.) Dense,	. aliv	re aray	(4)	22.8)	36,	$\mathbb{H}_{\sim}\mathbb{H}$	=			益	
E- 37	,	l.,,		\vdash	(5Y 4/1), SILTY Fine (ALLUVIUM)						\vdash				LOGGED	
E	7 14 21 17	1,1' 2,0' (55%)		M	CUCTO A ID:							크ㅣ			ဗ္ဗ	DATE
= 38	17	* 334.									SF	==			⋍	Č
E	}										19	引				
= 39							****	(4	cc,05	39.		目				
= "	3	2.0		M	(39.0-44.2 ft) Firm, (5Y 4/1), SILTY CLAY							# 1				
E	3 4	(70%)		H	(CL)						q2	三目				
- 40]`			Ц	from 40.2-40.4 ft., w	et, i	Fine, sandy clay				 @ 	31				
L .				1	layer							= 1			1	
41	3	1.7°		H								7				
E	3 4 4	(82%)		M	_	-					SP	31			846	
42	5			П	from 41.9-42.0 ft., w layer	et, i	fine, sandy clay				a	_			943-284B	5AS
E				Ц	•							#			4	P2205AS
37 38 39 40 41 42 43]_	1, 3,		+							-					ď,
E	2 7 11	(62%) 5.0, 1.3,		M							2P	3				<u>L</u>
44	18	ريمير		/ \				(4	415.1>	44.	الساد	4		,	JOB NO.:	FII FNAMF.
E			1111		(44.2-49.0 ft.) Campa (5Y 4/1), Fine SAND,	ct,	olive gray					31			89	L1
	[1			(SM), (ALLUVIUM)											u.

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LAUDLAW SOIL BOREHOLE LOG														7 1		
SITE NAME AND LOCATION								DRILLING METHOD:						BORNE NO.		
								6.25 inch I.D. Hollow Sten Auger						PZ-205-AS		
															3	
l								SAMPLING METHOD:						4 o r 4		
		LΑ	IDLAV	//OU2 (RI-FS/MO			SPLIT SPOON: 2.0 Inch 0.0.71.5 Inch 1.0. (SP)						DRILLING		
WEST LAKE LANDFILL OPERABLE UNIT 2								SHELBY TUBE: 3.0 Inch 0.0.72 13/16 Inch I.D. (SH						FINKSH	LAYNE-VESTERN	
			71. CV.	IDEE U	NAT C			WATER LEVEL	<u> </u>		}		TIME	TIME	ΓŘ	
								TIME	<u> </u>	<u> </u>	<u></u>		16:35		4	
1	IOR THE	NG: 1	106746	3.60				DATE			 		CATE	DATE 95 3/25/9		
DATUM E						EVATION 459.3		CASING DEPTH	<u></u>	<u> </u>	<u> </u>		3/53/	37 37 637 9	1 €	
DRILL RX		E 7:	***********	RUCK M			<u> </u>	RFACE CONDITIONS								
SAMPLE				EARING		**************************************	+-				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				DRILLING CONTR	
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H2	宝色	ځ		8							E					
<u>₹</u>	2	RECOVERY	SAMBOL.	₹				NUMBER NO					REJ		품	
(ELEVATION)	BLOW/ 6 IN. ON SAMPLER	2	8	SAMPLER SYMBOL		DESCR	IFTION	OF MATERIAL			SWAPLER TYPE					
1 2	80			₹.							29					
		·														
E	8	1.6°		M	(5Y 4/1)		act, trac	olive gray :e silt, wet, NR							1	
46	16	(80%)		H	(SM), (AL	LLUVIUM)					qz	三				
_]	1									(63)				1 1	S
E 47												E				W. HFRST
F "	3 5 50/4	11. 11.		M									ļ		1 1	.3
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E-49					End of	Soil Borehol	e La	g at 49.0 ft.				1 3	€ 48.5 Ft	encountere	vi	ب
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57 58 															JOB NO.:	FII FNAME:
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Well No. PZ-205-AS

Boring No. X-Ref: PZ-205-AS PIEZOMETER CONSTRUCTION SUMMARY

	PIEZOMETER CONST	RUCTION SUMMARY	
ļ <u> </u>	Survey Coords: Northing: 1067464 ft.	Elevation Ground Level	459.3 ft. NGVD
8 8	Easting: 515463 ft.	Top of PVC Casing	460.99 ft. NGVD
	Drilling Summary:	Construction Time log:	itart Finish
	Total Depth 49.0 ft. Borehole Diameter 14 1/4 in. (0.0-29.0 ft.) 8 1/4 in. (29.0-49.0 ft.) Casing Stickup Height 1.66 ft. Driller Layne-Western St. Louis, MO Rig CME 75, Schramm Portadrill T660H Bit(s) 6 1/4 in. and 10 1/4 in. ID Hollow Stem Auger Bits Drilling Fluid Auger-None	Task Date Drilling 3/25/95 CME 75 4/21/95 CME 75 5/6/95 Geophys.Logging: Casing: 2" PVC 5/5/95 10" Steel 4/21/95	Time Date Time 18:35 3/25/95 11:00 14:10 4/21/95 15:30 13:30 5/5/95 16:30 16:00 5/5/95 16:06 15:29 4/21/95 16:30
-20	Drilling Fluid Auger-None Protective Casing 8x8 In. Square Steel, by 5 ft. long Well Design & Specifications	Filter Placement: 5/5/95 Cementing: Development Bentonite Grout Bentonite Seal 5/5/95	16:05 5/5/95 16:45 17:00 5/5/95 17:30 16:45 5/5/95 17:00
-30	Basis: Geologic Log X Geophysical Log Casing string(s): C = Casing S = Screen	Well Development	5 1 1
-50	Depth String(s) Elevation	Stabilization Test Data: Time pH Spec	:. Cond. Temp (°C)
-60	Screen: S1 2 In. dia. Schedule 80 PVC, 0.010 in. machine cut slot, flush threaded with O-rings Sand Pack: 16-35 mesh Silica Sand, 36.0-49.0 ft. Filter Pack: Less than 50 mesh Silica Sand,	Recovery Data:	
-70	34.5-36.0 ft. Grout Seal: Wyo-Ben Grout Well Bentonite Slurry, 3.0-24.0 ft., Neat cement, 3.0-29.0 ft. Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry, 24.0-34.5 ft. Concrete: 0.0-3.0 ft.	90 80 70 80 40 30 10 0 20 40	SO SO 100
-90	Comments: Surface Casing C3: 10 in. ID / 10 7/	TIME (Minu	(65)
Not to Scale	Supervised by B. Tilton Site Job Number 943–2848 File Name	LAIDLAW/OU2 RI-FS/MO PZ205AS	



MISSOURI DEPARTMENT OF
NATURAL RESOURCES
DIVISION OF GEOLOGY AND

OFFICE USE ONLY	DATE RECEIVED	7
REF NO 122496	CHECK NO.	
ROUTE	TRANSMITTAL NO	
STATE WELL NUMBER	CROSS REFERENCE NO	
CHECKED BY	ENTERED	
	Ph 1 Ph 2	Ph 3
APPROVED BY	DATE ADDROVED	

CLAY THE SYMP	ON OF GEOLOGY AN SURVEY	ID	STATE WELL NUMBER	CROSS A	EFERENCE NO	
	ITORING WELL		CHECKED BY	ENTERED		
	TIFICATION REC	CORD	APPROVED BY	DATE AP		Ph 2 Ph 1
NFORMATION SU	JPPLIED BY OWNER		1			
ITE NAME		_ / .	WELL NUMBER			
[AIDCANU]	BRIDGETTAL CV.	INITARY LA	BRINGETANI	5/15	STATE	ZIP CODE
S.T. (CHARLES RIX'R	ED.	BRINGETON		Mo.	63044
PAME					TELEPHONE 3/4-24	11. 2210
DDRESS 1	ОКЧЕ БУБТЕМО Имоску	C1	TY		STATE	ZIP CODE
1838 N. KR	unicity		ST. Livis		Mo	63/63
NFORMATION SU	IPPLIED BY MONITO	RING WELL CON	ITRACTOR			
OCATION OF WELL HOW LOCATION IN	- C(OUNTY 57. Law		O THE WELL HIGHWAYS	INCLUDING MILE	AGE ON ALL ROADS TRAVELED
ECTION PLAT		ATION 457.3	<u> </u>	1.		₩ A
		EA NO:		4	,	(Istalia)
SMALLE	EST %	LARGES	т.	ر خ	site	X _a
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	twn. <u>47</u>			v *-	1 6 5	E
AT. 35 . 45	<u>55</u> " LONG74)	<u>5</u> .	*		`\
ESCRIBE LOCATION	OF THE WELL SO WE WOU	LD BE ABLE TO VISIT	if .		-	INSTALLATION
				CONT	RACTOR'S NA	AME
			**************************************	LAY	WE WESTER	EN Ca, INC.
				DRILLI	NG CONTRA	CTOR'S
	NOTE: Record the fraction of a foot in decimal, not in inches.	<u></u>	DCXING CAP - (Y) N (Circle one)	NAME		
	Tap of Riser	ء ــــــ کا	AP VENT/Y) N (Circle one)	100	E WESTERN	1 Che her
	Elevation:		ROTECTIVE CASING 1790. STEEL	TYPE OF II	NSTALLATION	
		Si Si	™ 5"15"x5"			☐ FLUSH MOUNT
Ground Surface 457.3 Feet Elevation: Ft Surfa	from Description of	11 1 L \ 1	PEEP HOLE - Y / N) (Carde one)	STATIC W	ATER LEVEL	
Information in this column to	Fermation		TEEP HULE - Y / N) (CADA DIA)		FEET FA	OM MEASURING POINT
be supplied in the Feet from	c'hy E		<i></i>	DATE OF S	TATIC WATER LEV	EL
Surface column	3.4			ELEVATIO	N OF MEASURING	POINT
	3//		PROTECTIVE CASING SEAL Type: Concrete		461.43	
Depth to bottom			Cement Sturry RISER PIPE		G POINT IS OF RISER PIPE	-
ol Protective 4.	O CONTRACTOR		Langth: 40.1'	3	ER	
	6-27		Diameter: つ		EQUIPMENT	
	Trush		Type of Malerial: SCH: dと かんと	LI AIR F	X YRATOR	AUGER TYPE 4/4/1.5.4.
	mush		BOREHOLE DIAMETER: B In.	☐ REVE	ERSE	
			ANNULAR SEAL	HOT	ARY 🗆	OTHER
			Type: Bentonte Slury Decement Slury	CENTRALI.	ZERS USED	TAL
			Non Sturry Bentonite		TAINLESS STEEL	
Depth to Base			BENTONITE SEAL Type: A Bentonite Stury	0	THER	
of Annular Seat: 34		HH -	Langth of Seel: 10.5 Ft	MULTIPLE	CASED WELLS	····
	27-31 3.14		SECONDARY FILTER PACK	1		AS BUILT DIAGRAM
Depth to Base of Bentonite Seat.			Type: [3 Sand (Optional)	SHOWI	NG WELL CO!	STRUCTION DETAILS
Depth to Base of Secondary	31.38	1117-	Gram Size: 2 50			ND GROUT USED.
Depth to Tap	o chy	HH	Length: /5' PRIMARY FILTER PACK	OATE WELI	L CONSTRUCTION	WAS COMPLETED
of the Screen: 212	33-49		Type: Da Sand		5-06-9	
	5.11 w/ sand		☐ Manufactured Grain Size: /6:35	HEREIN	DESCRIBED V	THE MONITORING WELL VAS CONSTRUCTED IN
			Length: /3'			E DEPARTMENT OF NAT-
Depth to			WELL SCREEN Length: 10	CONSTR	UCTION OF MOI	NITORING WELLS. ELL CONTRACTOR)
Bettom of the Screen: VA	4		Sioi Size: 0.00"	الرسو الر	E (MONITORING WI	THE KER IA
			Type: 3('H. 80 PHC) SUMP DETAILS			
Plug Back			Lengtic O. JFL		E (DRILLING CONT	
Plog Back Total Depth Original			Diameter: 2 in. Type: PVC	7	ا ۱۹۷۹ میں استان استان ہے۔ ان کا ایک ایک ایک ایک ایک ایک ایک ایک ایک	DATE
Total Depth: 44.	0		TYPE OF BACKFILL: SALAD	PERMIT NU	MBER	DATE
				1 00/3	158WH1	6-02-15

Drilling Log

Project N	leme	WESTLA	KE					Box	ting No.	D - ε	1
Project N	6 0.	84-07	5-4-00	2				Pac	7 0		of 4
Ground E	Sevetion	447	Location	n 196.2728 _ !	£. 92	2.019	75.	Tot	el Footeg	# G1	,5'
OrMng 3 E /		Hole Size 、		Redrock Foolege		ampies		2000	Depth '	To Water	Date Measured
REMA		see Remarks	61.5	. 0	1	<i>!</i> .	0		REM	E	**************************************
orithing C	c. .	WABASH	DRILLIN	G CO-		Driller (s	Do	84		RNTO	N
Xilling (N	ig.	ACKER A	1P-5,	TRUČK		Type of Penetra	ion Test	<i>\$</i> .	TAN	DARI	>
)ete		8-13-8	4 To 8-	15-84	F/1-24400000000000000000000000000000000000	Flets Ot	19 9 (V6/ (8)	G	LEN	ERN.	STMANN
						Store			Sample		
Copti)escription	***************************************	Cleas.	Count	Recov.		Sax No.		Restarks
/ = = = = = = = = = = = = = = = = = = =	BRO	WN FINE	SAWDY SI DAMP (F	ILT, LOW						5" s	orib Aud ' '5'
	LMA	AY. BROWN IX, 2" AND NEL AND	i), SOME	FINE							
5 7 7	BROW	IN CLAYS	 EY SILT,	40W					And the second s	•	
ゴ	PLA:	sticity,	DAMP TÓ	MeisT	-		4				
,, 1	BAOW MOIS	N FINE TO	S. LT, LOW	PLASTICITY	The control of the co	5/5/4	18"	\exists	SS-1	STOPP RESUP	ed 8-12-8 12) 8-14-8
🎞	SAND	JN SILTY , MEDIUM IRATED 6 - ?)	FINE TO DENSITY BELOW AP		•				/	エックのジ	TED TEREST TEREST LOV. 13

		ارندي والتنابة بربيات	-	ميونات كنيز بيس ۱۳۸۸		T		~ ·		7
	Name WESTLAKE			***		T	ng No. D		A.t	<u> </u>
Project				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Page	2		4	4
Project	No. 84-075-4-002	ina		Core	7	Date tox or	8-	13-	84	4
Depth	Description	Log Of Class	Slow Count	Recov.	Š	iox or ample No.	ner, and the same,	Rema	rks	
	BROWN SILTY FINE TO MEDIUM SAND, MEDIUM DENSE SATURATED BELOW APPROX, 13'		35/7	13°		S-2.	011 00 00	4. PM	VED TO	ļ
19	BROWN FINE TO MEDIUM SAND, WELL SORTED, SUBROUNDED GRAINS, MEDIUM DENSITY, SATURATED		3/0/4	\$) <u>\$</u>		is-3				
24	GRAY FINE SAND, TARCE		2/4/15	1 <u>0</u> **		55-4		÷		
30	SILT SAND IS M. GHLY QUARTEOSE, MEDIUM DENSE, SATURATED		12/5	1;- 8"	30 2 3 3 3 3 3 3 3 3 3 3	5-50	•			

						Bori	ng No. D - 8 /
roject l	Name WESTLAKE			, <u> </u>		Page	
roject	84-075-4-00Z			المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة المرابعة ا	**************************************	Date	8-13-84
) Septh	Description	Log Or Class	Blow Count	Core Recov. & Loss	S	Sox or emple No.	Remarks
33=	GRAY SILTY CURY MEDIUM TO HIGH PLASTICITY, ETIEF TO MEDIUM STIFF, MOIST TO SATURATED				בייני 	55-5 <u>.</u>	
34 = 35 =	GRAY SILT AND SAND INTEREDS, SILT IS LOW PLASTICITY, VERY LOOSE, SATURATED		*	3	5,0		*
34-		,	# 0\-\w	* OF "		S-4	NOTE: RODS SUNK G" WHEN SAMPLE SE-G WAT FIRST ATTEMPTED: NO RECOVERY ON FIRST
37 38			**	,		v	ATTEMPT SO RODS WEAE DRIPPED SACK DOWN THE HOLE ONDIA SAMPL OBTAINERS
39					70.0		
41	GRAY FINE TO COARSE SD.	,		18"	·	7-7	Qp = N.A.
42	GRAINS, HIGHLY QUARTE,	·		,			•
4,4	GRAY SAND AND GRAVE MAC)		•			-	,
4:	MEDIUM AND FINE SUBRICO	•	15 20 8	7" 18"	201111111111111111111111111111111111111	s-8	
	SEE DESCRIPTION BELO		•				

						Bor	ing No. D - 8/
Project	Name WESTLAKE	,			······································	Page	4 of 4
Project	No. 64-075-4-002					Det	
Depth	Description	Log Or Class	Slow Count	Core Recov. & Loss		Box or Semple No.	Remarks
49 =	GRAY SAND AND PINE GRAVEL INTERBEDS, SAND IS PINE TO COARSE, SUBROUNDED, QUARTEDSE						
50 <u> </u>	GRAVEL IS SUBANGULAR TO SUBANUNDED, QUARTE, FELDS PAR AND SOME MASIC MOMERALS,		15_		202	4< Q.	a- Gravel
	DENSE TO VERY DENSE		15.	10"	\exists		The Column
57 =	SATURATED O		2.2	18"	▮⊒	ss - 7i	+ SAND
	J.			4	74		.
25 <u> </u>	w.,				日		·
					=		
53 =			1		\exists	•	1.
	• ,				=		A STATE OF THE STA
54 =					Ė		· .
	,				=	***	
55 =	\mathscr{G}		13_	. 5	5.0		
			13 ST	18"	=		A 2" dies PUC
56=	, '		57	78"	\exists	SS-10	prezometer was installed to GO'.
	·			4	د.ي		PUC is flight
57 =	·•	1		,			Joint, thiraded
	· · · · · · · · · · · · · · · · · · ·	-		٠,	∃		Bottom 15' is
50=					╡		-010" machine
	· ·				\exists	•	Slotted scruen. Bottom 17.5' is
57=	Communication control		-		╡		gravel packed
_	SAND, LERY DENSE, SATURATED				3	•	with a 3' thick
60=			14		, <u>, , , , , , , , , , , , , , , , , , </u>		benton te rellet
			7/20/4	8" 18"	. =		Anulus is granted from seel to
61 =	•		44	18"	=	22-11	from seel to ground curtage.
_		.			4.5		T.O. C. 15 3'
62=	TOTAL BRETH GIS		-		_=		above grown withce
Ξ	TOTAL BRATH GIST		,,		ヸ		WATER LEVEL IS @
43=	- ()		1		Ξ		16.43' BELOW TAIR.
		,			uu Îuu		3:05 pm 8-15-83 C4 host after installation
<u>ا</u> ا					目		
					3		
					╛	ļ	,

Drilling Log

		KE		-			Bo	ring No.	D -	87
reject No.	84-07	5 - 4/-	202		****		P	-	1	d 7
rospa Sevetion		1	etion				Ta	ai Pooleg	 	11.7
Drilling Type	Hole Size			. 62. 9 No. 01		<i>B 7</i> No. Çare 8	-	Death 1	To Weser	Date Messure
REMARKS	SWEEKEE	111.0			2	0		\$2	ë	_
emg Co.	WABASH	DALLL	NG CO.		Driller (a)		ORL		THAK	RN+ON
Ming Pilg.	ACKER !		TRUCK	·*	Type of Penetral				MRD	7W 1 0 10
	8-9-84		8-10-84	······································		POLYOL (9)				5TM4W4
		- · · · · · · · · · · · · · · · · · · ·						Compie		•
apth	HT BADWA	Description		Olean.	Gount Count	Recur.		GW No.		Remorks
1 2 3 4 5 6 7	HT GRAV	GRAVE SAND, IT GRAY STICITY	TO DARK GRA	,	2/3/4			\$5-Z	•	OLID AUGEN

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						Boris	ng No. E	-87	
Project	Name WESTLAKE					Page		of 7	,
Project	No. 84-075-4-002			·•··		Dete	8 -	9-64	
Compile	Georgetten	Ling or Class	Siene Conse	Coru Respu-				- Australia	
W	MOTTLED LIGHT GRAY TO PARK GRAY TO BROWN SANOY, SILTY GLAY, MEDIUM PLASTICITY, STIPE MOTOR (FILL TRACE GRAVEL (2" MAK, DIA,)			<u>23</u> ** 24*		T-3	C 4, =	१८५ हड	
18 191	DARK GRAY SILTY CLAY, MEDIUM						•		
20	TO HICH PLASTICITY, WERY STEP,			<u>ग्र</u> ू		T-4	ଦ୍ •	2.75 T\$	-
24	DARK GRAY SANDY SILT AND SICTY SAND INTERSESS, SAND 15 MINE TO MERIUM, LOW TO NOW - PCASTIC, WET TO SATURATED			414		T-5	@ _t = .	M-A.	
27	BROWN TO CREY-NROWN SILTY						MAT DNS APPI	GRATED BRIAL OUNTER RORIMAT O' BELDI	FIRST LED @ ELY
30	FINE SAND, MEDIUM DENSE SATHERTED, SLIGHTLY MICACEOUS		3/7/8	/0" 	0.5	1-4			

					 Bori	ng No.カ- タフ
Project	Name WEST LAKE				 Page	
Project	No. 87-075-4-002	Y-1,	.,		 Dete	8-9-84
Ompth	O-molptica	Line er Class	Coting	Com Recov. & Less	Base or Sample No.	Remerter
35 32 32	BROWN TO GRAY-BROWN SILTY FINE DAND, MEDIUM BENSE SATURATED SUIGHTLY MICACEOUS				3 \$-4	NOTE: HOLE COLLAPSED TO ZG-7" AFTER EAMPLE ST"G WAS DEPAINED OCCURS ABOVE THIS DEPTH.
357	BROWN FINE TO MEDIUM SAND TRACE SILT, MY HIGHLY QUARTED DENSE, SATURATED	Ĺ	2/2/8	44	53-7	BECAN ROTARY WASH BERING W/ 4½" 314. TRI-CON BIT (3 30.0'
38	LIGHT BROWN FINE TO CORREE SAND INTERSEPOED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS, TRACE SILT, DENSE TO					<i>;</i>
** ** **	VERY DENSE, SATURATED		4/2/25	<u>8"</u> /8"	95-g	
44 44						
45 THE THE THE THE THE THE THE THE THE THE			7.07.4	<u>e"</u> 8"	is-9	

						Sorin	у No.D- В 7
TO JOCK						Page	4 of 7
roject	No. 84-075-4-002					Dete	8-9-84
كميدت	De _s aripsimo	Long OF Classic	Wayer Cornect	Core Reserv & Loss		Sou er Sample No.	Amendo
7	LIGHT BROWN FINE TO COMPLE SAND INTERSEDED WITH THIN (3" TO 10" THICK) GRAVEL SEAMS,				1111111		
	TRACE TILT, PRINSE TO VERY PENSE, SATURATED		1 1 1 50	<u> 10</u> " 1 0 "	बुंगागा है	£3-10	
	DARENISH DARE TO MEDIUM SAN TARCE DILT, DENSE TO VERY DENSE				7.		
_ 	SATHQATEP						
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7		·					
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3	•						
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Burns & MCDongol

Form 73-07-2-2

						Bori	ng No. 9-87
Project						Pege	
Project	No. 64-075-4-002	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				Date	8-7-34
Depen	Description	ing or Class	Canada Canada	Core Remov.	8	iax ar empis No.	Manustra
66	GREENISH DARK,GRAY FINE TO MEDIUM SAND, TRA-E SILT, DENSE TO VERY DEACH SATURATED		8/8/X	<u>/3"</u> /#"	8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6-13	570P### 8-9-84
47 = 48 =							RASUMEO 6-10-64
**							
70	·		30 23	18"		ડખય	
רונוווווו ניינו							
74 77 74 77 77 77 77 77 77 77 77 77 77 7	GRAY TO DARK GREENISH GRAY PINE TO CORRSE SAND, HIGHLY QUARTEDSE SUBROUNDED ORAINS, VERY DENSE TO MEDIUM DENSE, SATURATES FEW THIN (S" TO G") GRAVEL SEAMS		2 Sept / 34	14 ** 18**		3-15	
78 79 80 80			2 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2			5-14	

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roject i	Name WESTLAKE		*****				
roject			•		-	Page	G of 7 9-9-64
topict:	NO	Log	T	Cere		Date	8- 7-67
-	Description	Cine Cine	Elden/ Cristent	Core Reserv. & Loss		Gerror Sample No.	Remerks
=	COA						
_ =	GARY TO PARK GREENICH GRAY FINE TO	· -		•	▎╡]	
73 	COMESE PAPP, HIGHLY DESERTED	2	1	j] 📑]	
=	- SURPREMIDED CARLING LEAD	~			=		
*+ ∃	DENSE TO MEDIUM DENSE,				=	İ	
\exists			-	ĺ	7	- 1	
35 =	FEW THIN (S" TO 6" THICK)		.	١,	REAL]	
	GRAVEL SEAMS AT WITHHULL		5	94	\exists		
=	DE 1' 70 5'		10/4	9* 18"	3	\$5-17	
≫ -∃			'	. •	▎∄	25-17	•
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37 🗔			1		=		i
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⁻╡	MOTES SAND IS PREDOMINANTE	,			\exists	i	
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87	APPRIX THEFACTOUT BELOW			•	3		
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Burns & M'Ponnell

Form T3-GT-2-E

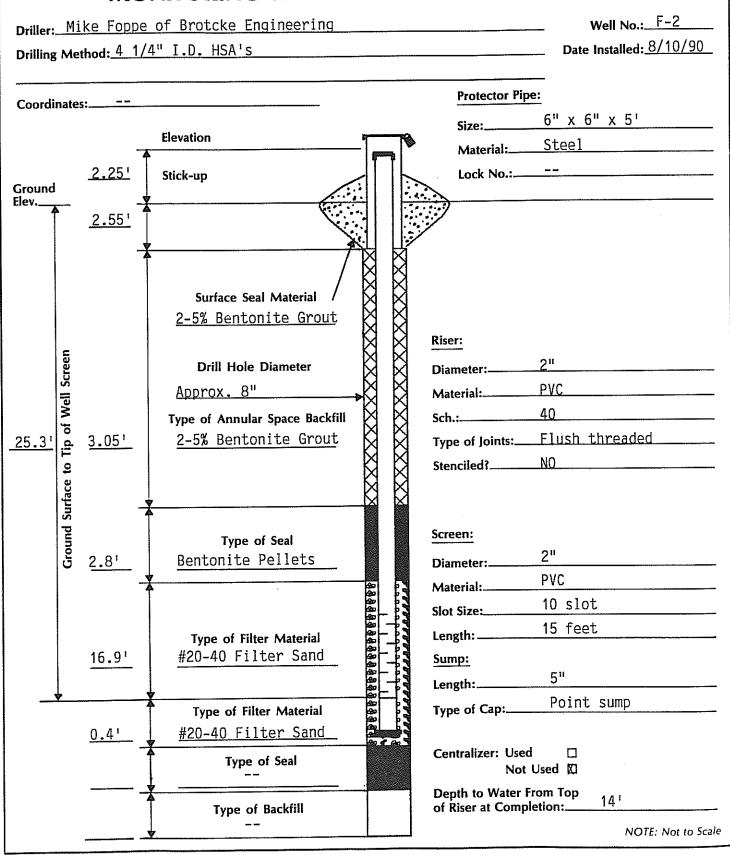
Log	OF TE	ST BORING NO.: CLIENT:		LAW/I	REID	GRTON		SUR	FACE ELEVATION:	
! !	PROJECT: AUG 90 WELL INSTALL PROJECT NUMBER: 89146 LOCATION:							BORING DEPTH: 25.0 DATE: 9-3-90		
l uer	เกยอดบ	FR;SAMP DEPTH				ਾ ਰਫ਼ਨਾ		 		
MSL ELEV 0.0	LND SI	JRF INTERVAL	TYPE	1	N	REC (ft)	Mon is Brown (10VP 5/3) silt with	CLASS	PIELD INSTRUMENTS	DRILLING AND SAMPLING NOTES Underground util-
-5.0	5	0-5	SB	1	-	2.8	some sand & clay; turns to Brown lean CLAY w/ silt later dk. brown (10YR 3/3); Grey v.f. SAND layer (lift ?) at 2.0'. See some crushed white limestone gravel at 4.5'	PILL	}	ity running nearby approx. 15' (?). Organics/sewer like odor noticed.
	- - 10	5-10	SB	2	-	•	Brown (10YR 4/3) lean CLAY with little silt & trace of gravel; Bottom 1 is mottled brown, yell-brown(10YR 5/6) & grey (2.5YR 4/0)	•	TIP = 2.3 ppm	
	-	10-15	SB	3	•	i i	lean CLAY. No recovery.	?	EXP = 28% LEL TIP = 220 ppm	istrong petroleum &:
-15.0	15 - - -	15-20	SB	4	•	2.8	Dark Grey (2.5YR 4/0) SILT w/ some v.fine sand and some stratified CLAY layers (2") 2" clay layer at 17.8'. Silt gradually coarsening to a v.f. SAND w/ little silt.	Į	RAD = 0 mR/hr 	lighter fluid like odors @ approx 13' Water added to lower EXP. level.
-20.0	20 - -	20-25	SB	5			to a v.f. SAMD w/ little silt. Dark Grey (2.5YR 4/0), f. to v.f. clean SAND; very stiff.	i	max.	Strong gasoline like odor.
-25.0	25 - -						E.O.B. = 25.0'			
-30.0	30 	 		1						
-35.0	- 35 -									
-40.0	40 									
-45.0	45			***************************************						
-50.0	- 50 -									
 	 - - 	 						GIADD	LEVEL INFORMAT	CH
DRILLING	COM	START DATE: IPLETION DATE: LOGGED BY: LLING METHOD: G CONTRACTOR:	8/9/9 LDA 4-1/4	0 * I.	D. H NGR.	ISA's		DEPTH LA'	AT COMPLETION: TER TIME/DEPTH: FER TIME/DEPTH: CAVE IN DEPTH: RILLING LOSSES:	13.5' 15 hrs / 14.9'

Foth & Van Dyke

DTW = 16.73 from PVC Top

Client:Laidlaw/BridgetonScope I.D.:89L46-21Project:8/90 Well InstallationPage:1Prepared by:L.D. AughenbaughDate:8/10/90Checked by:R.T. BloeseDate:9/6/90

MONITORING WELL CONSTRUCTION DIAGRAM



	S	`, ', ', '		Bo og		ıg	11	1	1918 Hai	ren
Γ.	<u> </u>			ing N			Project No./Nai	B¢		Page:
-	-9		٧I	22	29		07.0803035.003	.002		1 of 2
-	rt∕Finish D	ate					Site Name and I			
9/18					·	···		fill; Bridgeton, Mis		
	ling Cont Environm			rillina			Boring Location Ground Surface		Arca 2 448.5	
Dril				1 114 24 5			Northing:	. Dievauou.	1069329,26	
Мах	Tinnin						Easting:		514268.59	
Dril	ling Equip) tBe	e ¢					McLaren/Hart		W
	E-55 Drill	Rig,	Ηq	llow :	itean .			Tim Biggs / St. L		
•	Size/Type					Sample M		T.D. Borebole	Well Installed	?
	4" ID; 8 1/4 1acks:	4" H	Oic			5 Continu	ous Sampler	55.6	1-9	
		Т			************					
Depth (A)	Sample ID#		reiger.	Reading	(mR/hr)			Description		
Ĕ	<u>v</u> =	4	<u> </u>	<u> </u>		0.05011			*4.	
ı	WL-229	D.	a color	groun	d		nomi Deoris: sou ashy debris encour	consisting of brow	n siit, and asphal	5
5	5	1		-0.04		1 100	ashy ucoris ciranii	ite ed., dry.		
,		Ť	····					 		
	None	B	ck	Stonus	ď	5.0-56.0' 1	lative Alluvium:	dark gray, silty, fin	e-grained sand	
10	Taken	(0	01	-0.04)		gradi	ng to coarse-grain	ed sand with grave	; moist to wet.	
	None		. سام							
15	Taken	3		groun -0.04)				-		
A		1				@16	' wet			
	WL-229	Ba	ckį	ground	4					
20	20'	(0	01-	0.04)						
	1177 000	_			,					
25	WL-229 25'	4	•	ground -0.04)						
		۳		J. 47)						
	WL-229	Ba	ck	ground	1					
30	30'	(0.	01	0.04)						
35	None	No.								
1.3	Taken	1a	ker	·						
	None	No	me							
ю	Taken	1	ken		ĺ					
		Τ								
	None	No	ne		l					
15	Taken	Ta	ken	1						
					l					
	None	No								
0	Taken	13	ken	1	1					

•

	S	oil I		• • • • • •	ıg		1 /	y <u>cıaren</u> Hart		
1-9 Boring No. WL-229						Project No./Na 07.0803035.003	Page: 2 of 2			
Star	√Finish Dı	ile				Site Name and	Location			
9/18	/95					West Lake Land	fill; Bridgeton, Mi	ssouri		
Dril	ling Contra	ector				Boring Location	RS .	Arca 2		
Hart	Environme	ntal Dr	illing	<u> </u>		Ground Sartec	e Elevation:	448.5		
Driller						Northing:		1069329.26		
Max Tinnin						Easting:	514268.59			
Drilling Equipment							McLaren/Hart	Geologist/Office		
CMI	E-55 Drill R	ig, Hol	low S	Stem .	Augers	Tim Biggs / St. Louis				
Bit S	ize/Type				Sample M	ethod	Weil Installed?			
4 1/4	* ID; 8 1/4	Hole:			5' Continue	ous Sampler	55.6'	I-9		
Rem	arks:									
Oepth (ft)	Sample ID#	Gelger	Reading	(mR/hr)			Description			
55	None Taken	None Taken			50.0-55.6' Native Alluvium: dark gray, silty, fine-grained sand grading to coarse-grained sand with gravel; moist to wet.					
60	None Taken	None Taken			Boring term	ninated @ 55.6°				

Notes:

Radiological samples collected at 5 and 20 feet below ground surface.

Non-radiological samples not collected during boring activities.

Perched water not encountered during boring activities.

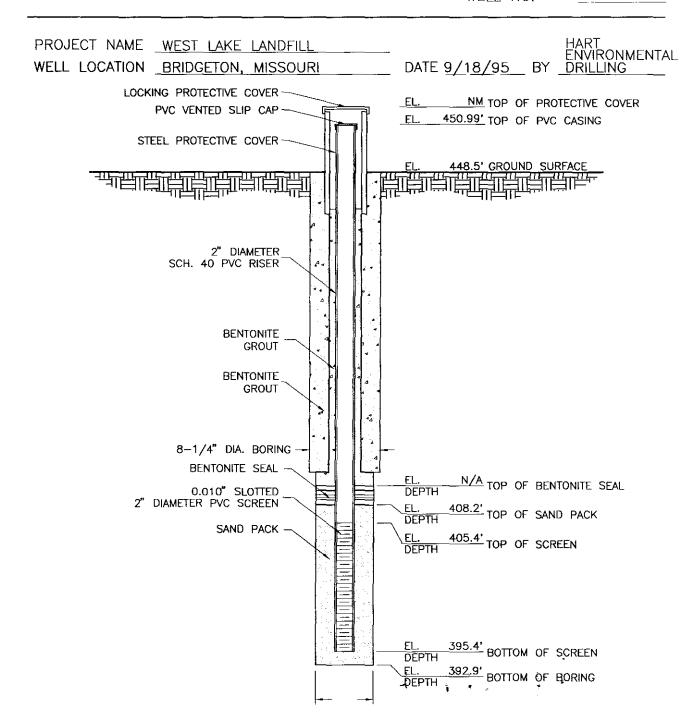
Groundwater encountered at 16 feet below ground surface.



MONITORING WELL DETAILS

PROJECT NO. 070803035 WELL NO.

<u>l-</u>9



NOTES:

- 1. REFER TO SOIL BORING WL-229 FOR SOIL DESCRIPTION.
- 2. DETAIL NOT TO SCALE.
- 3. NM = NOT MEASURED.
- 4. N/A = NOT APPLICABLE; BENTONITE GROUT USED TO SEAL WELL UP TO SURFACE.

SUBSURFACE EXPLORATION DA

Boring No	38
Coordinates	Sheet 1 of 2
Surf. Elev	

THE BY . 33 BB: 38W LAD SIL

Date of Drilling: WABASH DRILLING COMPANY Started 6-22-78 110 Angelica St. - St. Louis, Mo. 63147 - 421-2460 Gr. Water Elev. --Finished 6-23-78 Hostlake Quarry & Material Co. Job Name Westlake Landfill __Client's Job No.__ Job Location St. Charles Rock Road City Bridgeton State Mo. Sampler O.D. 2" (.D.1-3/8" Casing O.D. Sampler Hammer 140 lbs. 30" fall Casing Hammer ______fall W. D. Co. Foreman Gary Johanning __Client's Inspector_ Penetration (II Sampler (inches) Blows On Casing Sample Number Depth Below Ground Surface FIELD IDENTIFICATION OF SOIL Blows Un Sampler REMARKS (include relative firmness, relative moisture, color, mention all soil constituents, etc.) Trash & white chat 1 16" Used 6" H.S. AUger White chat I" minus 7'0" Moist, yellowish-tan, medium stiff clay 3 0" Moist, brown, firm, silty-clay with traces of fine sand 9 10" Moist, gray, madium stiff, plastic clay with traces of rust stains 16 ° 6" Moist to wet, brown, loose, fine sand with traces of gravel 3E'0" Wet, gray, medium dense, fine sand (Cont'd.)

- F1 'd - ----

SUBSURFACE EXPLORATION D Date of Drilling:

+y + * -4.

WABASH DRILLING COMPANY

Boring No38	·	
Coordinates Shee	E 2 0	F Z
Surf. Elev		
Gr. Weter Flow		

Started 6-22-78 Finished 6-23-78 110 Angelica St. + St. Louis, Mo. 63147 + 421-2460 Client Westlake Quarry & Material Co. Job Name Westlake Landfill __Client's Job No. _ Job Location St. Charles Rock Road City Bridgeton State Mo. Sampler 0.0. 2" .____ I.D. 1-3/E Sampler Hammer 140 lbs. 30" fall Casing Hammer _____ibs.____fall W. D. Co. Foreman Gary Johanning _Ctient's Inspector_ Ponnination Of Sampter (inches) Sample Number Dapth Below Ground Surface FIELD IDENTIFICATION OF SOIL Blows On Sempler 5 REMARKS (include relative firmness, relative moisture, color, mention all soll constituents, etc.) Blons Casing Set bottom of well point @ Wer, gray, medium dense, fine 50'0" and back send filled with " minus rock. 50'0" Total depth of boring 50'0"

DRILLING LOG



SB/MW	#:	I-7.	3
Log #: _			
Page	1	of	2
Geoscies	tist:		

PROJECT:	w	estlake			800556
	Bridgeton, Missouri			TOC ELEVATION: 44	62.6
	(S): 6/22/78	6/23/78	START:	FINISH:	
SAMPLING METH			MONITORING DEVICE:		
SUBCONTRACTO		1			
DRILLING METH		NO	TES:		
ļ -					

Depth Below Surface (ft.)	Sampler Interval/ Recovery	Sample *CI	PID reading (ppm)	Soil Description Color, Texture, Molsture, Etc.	Unified	Graphic Log	Well Construction Details
				TRASH & white CHAT (FUL)		XXX	
-2				CHAT; white, 1° minus		\bowtie	
-4						$\otimes\!$	
-6							·
9				CLAY; yellowish tan, med stiff, moist	- 		
	İ						
-10							
-2 -4 -6 -8 -10 -12 -14 -16 -20 -22 -24 -26 -30							
-14		•		Silty CLAY; tr fine Sand, brown, firm, moist	CL ML		
-16							,
-18							1 1
-20				CLAY; gray, med stiff, to rust stains, moist			
	ŀ						
-22				·			
-24			1		1		
-26					SM		
-28				SAND; brown, loose, fine, tr Gravel	GM		
-30							
-10							
-32 -34				•			
-34			,				
-36				SAND; gray, med dense, fine, wer			
-38							
-40			` '	•			
-42 -44						ŀ	
-44			i i	· · · · · · · · · · · · · · · · · · ·			
-4 6							-
-46 -48							
-50							<u> </u>

IGNATURE OF FIELD SUPERVISOR	SIGNATURE OF REVIEWER
Assistant Geoscientist	Project Manager
ritle	TTLE

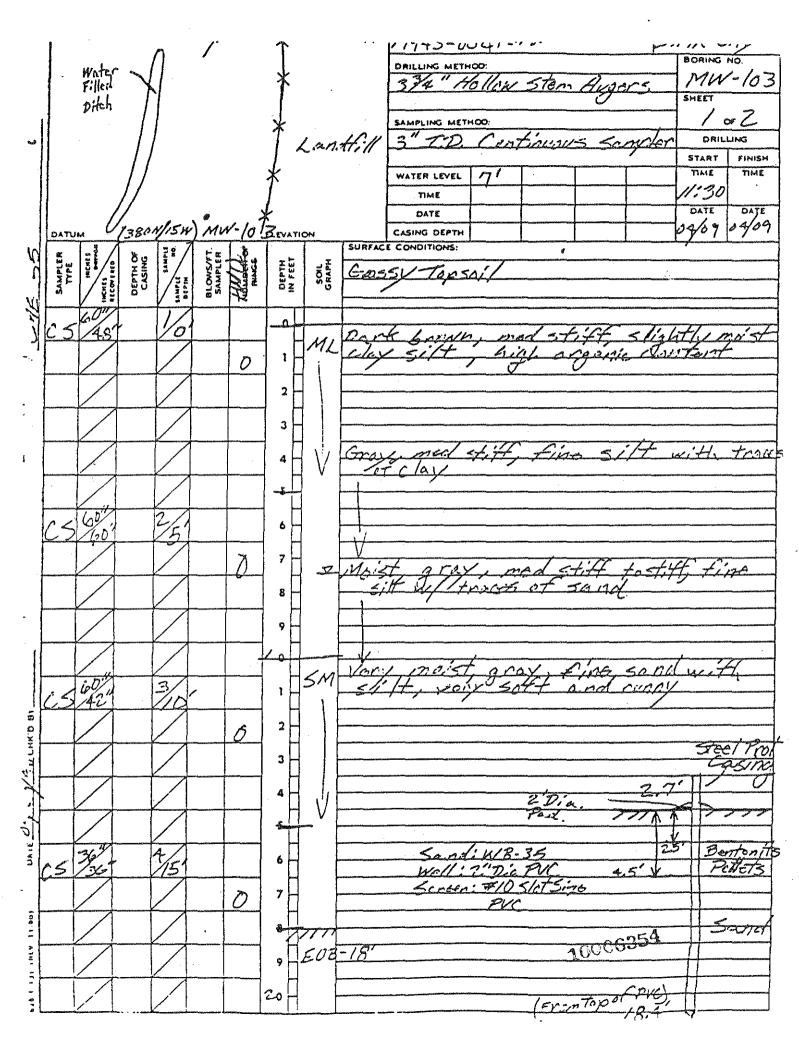
DRILLING LOG



SB/MW	#:		,	1-73		
Log#: _						
Page		2	of		2.	

PROJECT: Westlake						DJECT#: 11.0800556
Sampler Interval/ Recovery	Semple D#	PTD reading (pper)	Soil Description Color, Texture, Moisture, Etc.	Unified Classification	Graphic Log	Well Construction Datails
			Total depth = 50.0'			
			. •			
				į		
		,				
	* ,	`,	•			
						-
	Sampler Interval! Recovery	Sampler Interval Recovery Sample Diff	Sampler Interval Recovery Sample D# PID reading (pptt.)	Soil Description Color, Texture, Molsture, Etc. Total depth = 50.0'	Soil Description Color, Texture, Moisture, Etc. Total depth = 50.0'	Soil Description Color, Texture, Moisture, Etc. Description Color, Texture, Moisture, Etc.

SIGNATURE OF FIELD SUPERVISOR	SIGNATURE OF REVIEWER
Assistant Geoscientist	Project Manager
TITLE	TITLE



MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION	308 NUMBER 19943-002
TOP OF WELL CASING ELEVATION 441.1	6 BORING MUMBER MW-103
•	DATE 04/09/90
TTT	LOCATION . Farth City MO
	DEPTH TO BOTTOM OF VELL POINT OR SLOTTED PIPE 15.7 FEET.*
THE THE REPORT OF THE PARTY OF	DEFTY TO BOTTOM OF SEAL (IF INSTALLED) Sentenite Reliets
	DEPTH TO TOP OF SEAL (IF INSTALLED) 2.5 FEET.*
	LENGTH OF WELL SCREEN /O FEET.
	3 TOTAL LENGTH OF PIPE 8.4 FEET AT 2 INCH DIAMETER.
(5) (10)	TYPE OF PACK AROUND WELL POINT OR SLETTED PIPE Sand
	T CONCRETE CAP. (CIRCLE ONE)
15)	HEIGHT OF WELL CASING ABOVE GROUND 7.7 FEET.
3	PROTECTIVE CASING? (FES) HO (CIRCLE ONE) HEIGHT ABOVE GROUND 18 FEET. LOCKING CAP? (TES) NO (CIRCLE ONE)
	10 TYPE OF UPPER BACKFILL cement slorry
	1 BOREHOLE DIAMETER 8 INCHES.
	12 DEPTH TO GROUND WATER
16	(1) TOTAL DEPTH OF BOREHOLE /8 FEET.*
	(1) TYPE OF LOVER BACKFILL Natural sand +5 ilt
	(5) PIPE MATERIAL PVC.
14	(16) SCREEN MATERIAL PVC.
	*(DEPTH FROM GROUND SURFACE)
13	*(DEPTH FROM GROUND SURFACE)

MONITOR WELL INSTALLATION DETAILS

Landhill BORING NO. DRILLING METHOD: 334" 2D Hallow 560 MW-104 DE MWIOY / | colvert or / SAMPLING METHOD: (40N/15E) ID Continuous Simples DRILLING ditch START FINISH TIME WATER LEVEL 8:20 9:00 TIME DATE DATE DATE 4-11-90 CASING DEPTH ELEVATION DATUM SURFACE CONDITIONS: DEPTH OF CASING DEPTH IN FEET Grassy Topsail moist dark Goven topsoil silt do sudy silt 1 2 3 CS 60/18 Us 5-10 54: f.f Medium Grawn 6 7 Mediun Gvzice. Stains 8 3 hiff 6 vscus Me dium 9 5 CG Fine sand / o 10/15 1 ٥ 2 3 Ċ. 4 15 15/17 6 17 EZB 17' 8 10006353 9 ¢

MONITOR WELL INFORMATION SHEET

GROUND SURFACE ELEVATION	JOB MUMBER / 1943-002
TOP OF WELL CASING ELEVATION	441.88 BORING NUMBER MW-104
•	DATE 4-11-90
	LOCATION . Earth City MO
9 3 7	DEPTH TO BOTTOM OF WELL POINT OR SLOTTED PIPE 17 FEET. *
THE WELL STORY	OPPTH TO BOTTOM OF SEAL (IF INSTALLED) FEET. * Bentanite Pellets
	DEPTH TO TOP OF SEAL (IF INSTALLED) 3.3 FEET.*
	(LENGTH OF WELL SCREEN /O FEET. SLOT SIZE O- 010 .
(11) ∇(12)	TOTAL LENGTH OF PIPE 9-9 FEET AT A INCH DIAMETER.
5) 10	TYPE OF PACK AROUND WELL POINT OR SLOTTED SAND
	() CONCRETE CAP. YES NO (CIRCLE ONE)
(15)	HEIGHT OF WELL CASING ABOVE GROUND
3	PROTECTIVE CUSING? (VES) NO (CIRCLE ONE) HEIGHT ABOVE GROUND FEET. LOCKING CUP? (CIRCLE ONE)
(2)	(10) TYPE OF UPPER BACKFILL COMENT.
	11) BOREHOLE DIAMETER 8 INCHES.
	12 DEPTH TO GROUND WATER
16)	13 TOTAL DEPTH OF BOREHOLE 17 FEET.*
	IN TYPE OF LOVER BACKFILL NA.
	15) PIPE MATERIAL PUC.
<u>(4)</u>	(16) SCREEN PLATERIAL PVC.
	* (DEPTH FROM GROUND SURFACE)
13	100063 61

MONITOR WELL INSTALLATION DETAILS

RECORD OF DRILLHOLE PZ-205-SS Sheet 1 of PROJECT: LAIDLAW/RI-FS BORING METHOD: NX Core & water COLLARIELEV: 459.5 DATUM: MSL PROJECT NO: 843-2848 LOCATION: BRIDGETON, MO DRILLING DATE: SPILL RIG: CME 75 E: 515477.78 5/17/95 - 5/19/95 COOFDINATES N: 1087483.54 AZIMUTH: 0 INCLINATION: -80 PL-Planar C-Curved U-Uncklating P-Poished K-Signsided SM-Smooth Fe-Fe-Dixide CL-Clay Infil CH-Change F-Fault B-Shear B-Bedding F-Foliation WEATHERING INDEX OFFENTATION STRENGTH POINT LOAD 8 50 NDEX R-Rough VR-V, Rough H-Healed GRF-Gravel Filed ST-Stapped DEPT. NOTES i-irrage.na NOEX GRAPHIC WATER LEVELS DESCRIPTION TINUITY DATA FRACTURE PER FOOT INSTRUMENTATION ELEV CORE AXIS TYPE AND SURFACE ROD % ₹ 5555 E 1555 HUN GRAPH COG DEPTH (FT) DESCRIPTION 경우문 2 2 48 0.0-49.0 ft. See Soil Borehole Log PZ-205-AS 0.0-49.0 ft. Borehole advanced with 10.25 in, ID hollow stern 49.0-54.0 ft. augers 49.0-54.0 ft. No samples collected Borehole advanced with 9 7/8 in, bit using mud rotary then 6 in, steel casing grouted into annulas with neat cement Bedrock encountered 50 @ 48.5 ft 52 405.50 54.00 405.50 54.00 54.0-67.5 ft. 5/18/95 @ 8:15 Began coring Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS FORMATION) 56 J,PL,SM,Fe J.PL.SM J.ST.SM 58 J,C,SM,Fe 5/18/95 @ 8:40 End of Run 1 59.00 B,PL,SM 60 2 99% 82 62.3-69.5 ft, Grain size is medium grained J,PL,SM (2) J,PL,SM - 64 DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN LOGGED: D. ALLOWAY CHECKED: B. TILTON **Golder Associates** DATE: 8/20/95 DRILLER: D. MAHURIN

RECORD OF DRILLHOLE PZ-205-SS Sheet 2 of PROJECT: LAIDLAW/RI-FS BORING METHOD: NX Core & water DATUM: MSL COLLAR ELEV: 459,5 PROJECT NO: 943-2848 DRILLING DATE: 5/17/95 - 5/19/95 COORDINATES N. 1087483.54 E: 515477.78 LOCATION: BRIDGETON, MO DRILL RIG: CME 75 AZIMUTH: 0 INCLINATION: FIOCK TYPE J-Joint F-Fault S-Shear P-Polished K-Sikaraided Fe-FeChode CL-Clay Infit PL-Planar WEATHERING INDEX C-Curved OHIENTATION POINT LOAD STHENGTH CH-Chiome H-Healed GRF-Gravel Filed U-Undutation SM-Smooth (psd) DE) (Fee f) 8-Badding 57-Stepped R-Rough VR-V, Bough NOTES NDEX (F-Foliation i-irratrial GRAPHIC WATER LEVELS DESCRIPTION DISCONTINUITY DATA RECOVERY FRACTURES PER FOOT INSTRUMENTATION ELEV DIP wri TYPE AND SURFACE ACO PUNI DEPTH (F1) DESCRIPTION 강충합물 8 64 54.0-67.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, ARGILLACEOUS LIMESTONE, (ST. LOUIS J,PL,A FORMATION) 65.0-75.9 ft. Scattered chert nodules B,PL,SM (2) 65,8-66,0 ft. Claystone layer 66 J,PL,SM,Fe 2 67.5-99.5 ft. o7.3-93.5 ft.
Fresh, medium to thinly
bedded, pale yellowish brown
(10YR 6/2), very fine grained,
weak, LIMESTONE, (ST. LOUIS
FORMATION)
Stylolitic 5/18/95 @ 10:40 End of Run 2 390.10 J.PL.R.Fe J,PL,A 69.8-75.9 ft. ob.6-73.9 ft.
Very fine to microcrystalline
zones of thinly laminated
layers of clay within the
Ilmestone, color is medium
light gray (N6) 70 ♣기'1'남 ♣기'1남(5) 100 3 72 J,PL,A J,I,R 5/18/95 @ 11:45 End of Run 3 Ended drilling for the J,I,R (3) 385.00 74.50 day due to bad weather. 5/19/95 @ 7:40 Began drilling J,PL,R J.FL.R.Fe 76 J,PL,A 76.6-77.4 ft. Argillaceous layer 108 4 J,PL,A 78 J,I,R 78.7-80.0 ft. Argillaceous zone, unfilled vugs (1-3 mm. in diameter) J.PL.A J.PL.A (2) BO DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN LOGGED: D. ALLOWAY **Golder Associates** CHECKED: 8. TILTON DRILLER: D. MAHURIN DATE: 6/20/95

RECORD OF DRILLHOLE PZ-205-SS Sheet 3 of 4 BORING METHOD: NX Core & water DRILLING DATE: 5/17/95 - 5/19/95 DATUM: MSL COORDINATES N: 1087483,54 COLLAFI ELEV: 459.5 E: 515477.78 PROJECT: LAIDLAW/RI-FS PROJECT NO: 943-2648 LOCATION: BRIDGETON, MO DRILL RIG: CME 75 AZIMUTH: 0 INCUNATION: ROCK TYPE PL-Planar C-Curved U-Undulating P-Poished K-Sikensided Fe-Fe-Colds CL-Clay Infit J-Joint F-Fault WEATHERING INDEX POINT LOAD INDEX (psi) CHIENTATION DEJ JALE (FEET) STRENGTH CH-Chioms H-Healed GRF-Ckavel Filed S-Shear B-Bedding SM-Smooth INDEX R-Rough VR-V. Rough ST-Stepped NOTES F-Fointor I-line guier GRAPHIC WATER LEVELS DESCRIPTION NTINUITY DATA FRACTURES PER FOOT INSTRUMENTATION ELEV 皇 30 CIP WII CORE 60 AXIS RQD TYPE AND EDG. RUK CEPTH SUSFACE (FT) DESCRIPTION 335 SEER FREER °..." □ 2248 67.5-99.5 ft. br.5-9.3 ti.
Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained. weak, LIMESTONE, (ST. LOUIS FORMATION)
Stylolitic J,PLR (2) J,PL,A 81.8-86.4 ft. Argillaceous zone, unfilled vugs, (1-3 mm. in diameter) 82 100 J,PL,R 5/19/95 @ 9:15 End of Run 4 J,PL,R J,PL,R 84.5-86.4 ft. Color grades to light olive gray (5GY 8/1) 8,PL,SM J.PL.SM J.PL.SM J,C,SM J,PL,A 88 88.6-93.8 ft. Argitlaceous, vuggy, color is light olive gray (5GY 6/1) 5 90 92 B,PL,SM 5/19/95 @ 10:40 End of Run 5 94 365.00 94.50 94.5-97,5 ft. Argillaceous, color is light olive gray (5GY 6/1) 100 J.PL,SM 96 LOGGED: D. ALLOWAY DRILLING CONTRACTOR: LAYNE-WESTERN DRILLER: D. MAHURIN CHECKED: B. TILTON **Golder Associates** DATE: 6/20/95

PR	OJECT: LAIDLAW/RI-FS OJECT NO: 943-2548 CATION: BRIDGETON, MO		DRI	ing i Lling	REC METH DATI 3: G	OD: E:	NI Bi	X C		ā w	ate	ŧ	_H	OI	D/ Ci	5-S	VI: I	TES		1	007	483	.54				Sheet 4 of 4 AR ELEY: 459.5 E: 515477.78 INATION: -90
FEET)	ROCK TYPE	9010	J-John F-Fau S-She B-Bec F-Foir	t It ar kdesg store		P(C) U)	-Pla Cun Und -Sta	107 1100 140 140	ng d		S	-Sac M-S -Flor	isher ensi moo ugh . Rou	cied iti aght	F#-F#Oxide CL_Ctay triff CH-Chiome H-Healed GRF-Gravel File	ed		WEATHERING	NDEX	HIUNGEL	MOEX	, T. C.	!	POINT LOAD	INDEX (psl)	TEST CHIENTATION	
DEF	DESCRIPTION	GRAPHIC LOG	ELEV DEPTH (FT)	RUNNO	CORE	P(00 20	22	PHACTURES	FER FOOT	0.1	30 DIP wrt	GONE CORE	8	CONTINUITY DATA TYPE AND SURFACE DESCRIPTION	9				ļ	- 1		}				WATER LEVELS INSTRUMENTATION
- 96 - 98	67.5-99.5 ft. Fresh, medium to thinly bedded, pale yellowish brown (10YR 6/2), very fine grained, weak, LIMESTONE, (ST. LOUIS FORMATION) Stylolitic 97.5-99.5 ft. Thin clay laminae			8	100 %				every the literature and the second s				THE THE PROPERTY OF THE PROPER		J.I.R.Fe J.PL.SM.CL J.I.R												5/19/95 @ 11:30 Finished drilling
- 100	360,00 End of Record of Drillhole 99.50 at 99.5 ft.		380.00 99.50									Tana un consensation de la conse									6.7						
- 102												**************************************				***************************************				***************************************							
104							***************************************					***************************************				***************************************											
108			- Anna Addissa Addissa salaska ara - Addissa sana ara ara Addissa sana ara ara ara ara ara ara ara ara ara									ALL PROPERTY OF THE PROPERTY O						desirable and a first commission of the second second second second second second second second second second				10		***************************************			
– 110 – 112									The state of the s		***************************************						***************************************	***************************************))							
DR	DEPTH SCALE: 1:2 DEPTH SCALE: 1:2 DRILLING CONTRACTOR: LAYNE-WESTERN DRILLER: D. MAHURIN DATE: S/20/95 Golder Associates DATE: S/20/95												1	11													

Well No. PZ-205-SS

Boring No. X-Ref: PZ-205-SS

		PIEZOMETER CONST	RUCTION SUMMARY	
\		Survey Coords: Northing: 1067484 ft.	Elevation Ground Level	459.5 ft. NGVD
	-	Easting: 515478 ft.	Top of PVC Casing	461.78 ft. NGVD
-0 F	7	Drilling Summary:	Construction Time log:	
		Drilling Schillary.		tart Finish
		Total Depth 99.0 ft.	Task Date	Time Date Time
		Borehole Diameter 9 3/4 in. (0.0-54.0 ft.) 5 7/8 in. (54.0-99.0 ft.)	Drilling	
		Casing Stickup Height 1.66 ft.	CME 75 5/18/95	8:15 5/19/95 11:30
-15	12	Driller Layne-Western	Schramm Rotary 5/21/95	13:30 5/21/95 14:30
	ECTED	St. Louis, MO		
	0.0	Di CALE DE CALE DE L'III TORRIA	Geophys.Logging:	
	181	Rig CME 75, Schramm Portadrill T660H Bit(s) 6 1/4 in. ID Hollow Stem Auger Bit, NX Core,	Casing:	
		5 7/8 in. Button Bit and 9 3/4 in. Tricone Bit	2" PVC 5/21/95 6" Steel 5/11/95	7:30 5/11/95 11:00
	SAMPLES	Drilling Fluid Auger-None, NX Core Water,	37773	7.50 377795 77.50
-30	<u>a</u>	Air and Mud Rotary	Filter Placement: 5/21/95	14:40 5/21/95 15:15
	₹	Protective Casing 8x8 in. Square Steel, by 5 ft. long	Cementing:	
			Development	
	2	Well Design & Specifications	Bentonite Grout 5/21/95 Bentonite Seal 5/21/95	15:20 5/21/95 15:35 15:15 5/21/95 15:20
	~	•	201101110 Ocal 321183	19.12 9/5/142 19:50
-45		Basis: Geologic Log X Geophysical Log		
		Casing string(s): C = Casing S = Screen	Well Development	
		Donth String(s) Flavoting		
		Depth String(s) Elevation + 1.66 - 88.57 C1 461.78 - 370.96		
		+ 1.66 - 88.57 C1 461.78 - 370.96 88.57 - 98.37 S1 370.96 - 381.16		
		98.37 - 98.70 C2 361.16 - 360.83		
		+1.00 - 54.00 C3 460.50 - 405.53		
			Stabilization Test Data:	
	田田		**************************************	
			Time pH Spec	. Cond. Temp (°C)
		Casing: C1 2 in. dia. Schedule 80 PVC,		
-75	江	flush threaded with O-rings C2 2 in. dia. threaded PVC end cap		
	曲	(4 in. long or 0.33 ft.) (C3-see comments)		
		Screen: S1 2 in. dia. Schedule 80 PVC, 0.010 in.		
1950 H.S.		machine cut slot, flush threaded with		
	田	O-rings		
-90 =		Sand Pack: 16-35 mesh Silica Sand, 86.0-99.0 ft.	Recovery Data:	

		Filter Pack: Less than 50 mesh Silica Sand,	100	
		84.5-86.0 ft.	80	
		Grout Seal: Wyo-Ben Grout Well Bentonite Slurry,	E 60	
-105		3.0-70.0 ft.	X RECOVERY	
103		Bentonite Seal: Extra high yield Wyo-Ben (100%)	× 30	
		Slurry, 70.0-84.5 ft.	10	
		Concrete: 0.0-3.0 ft.	0 20 40	60 80 100
			TIME (Minut	es)
		Comments: Surface Casing C3: 6 1/8 in. ID / 6 5	/8 in. OD Steel Casing	
<u> </u>			All (
			, <u>, , , , , , , , , , , , , , , , , , </u>	
Not to Sc	cole	Supervised by W. Herst Site	LAIDLAW/OU2 RI-FS/MO	
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Job Number 943-2848 File Name	·····	



MISSOURI DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGY AND LAND SURVEY

OFFICE USE ONLY	DATE RECEIVED
REF NO 122506	CHECK NO.
ROUTE	TRANSMITTAL NO
STATE WELL NUMBER	CHOSS REFERENCE NO
CHECKED BY	ENTERED
	Ph! Ph2 Ph3
APPROVED BY	DATE APPROVED

		DRING WELL ICATION REC	OR	D		APPROVED BY		Ph I Ph 2 Ph 3 OATE APPROVED							
		IED BY OWNER		_											
SITE NAME		······································			,		WELL NUMBER		·	<u> </u>					
	BRI	NGETON SAL	ITA	E.		***************************************	P2-205	35	T						
SITE ADDRESS	HARL	ES ROCK RI	5 .		Cat	BRIDGE	TOAL		STATE Ma	21P CODE 63044					
NAME							- 1 - 1 - 1		TELEPHONE						
LAIDLAVI	WASI	e Systems,	MC	•	Cit	rv			314-24 STATE	1-3710 ZIP CODE					
ि हिंदु था	⊒iΩtX/i	LAY				St. Live	15		Mo	63162					
		IED BY MONITO	RING	w	ELL CON	TRACTOR									
LOCATION OF W		C	UNT	Y	ع. لس	SKET	CH THE LOCATION T	O THE WEL	ב ואכנטטואס אונפי	AGE ON ALL ROADS TRAVEL					
SHOW LOCATION SECTION PLAT	IN	ELEV	ATION	۰	454.5		NEAREST TOWNS OF	HIGHWATS		2					
F-F		AR.	EA NO	۰. ـــ				\$\frac{T}{2}	1) 5 to 1	(soft					
SM,	ALLEST !	•			LARGES	τ ''		*		100					
<u> [[∓!∓!∓</u>] —	%	V4		,						, Xe					
SEC)	TWN. 47	N,RN	G.	<u>. 5</u>	w Roga.			4	y /&					
LAT. 35	45 ·	35 LONG. 4	. ر	_;	160 4	2			E/ *	> *					
		HE WELL SO WE WOU				- 1		MONI	TORING WELL	LINSTALLATION					
								CONT	RACTOR'S N	AME					
ļ 	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,							- , ,,,,	ie Wester	M Co., INC.					
									ING CONTRA	•					
	ноте	E. Record the fraction of a foot in decimal, not in inches.][ta	CKING CAP - (Y)	N (Gucke one)	NAME		CIUNS					
		Top of Riser Elevation: <u>JL1 B</u>	\mathcal{L}_{\perp}	<u>- 1</u>		AP VENT (Y) N (C		LAY	NE WESTER	ZN Contre.					
		Elevation: 1161 C		٦,	T ₁	PE STEEL		TYPE OF	INSTALLATION						
Ground ,						≖ 3″⊁೮×	5	L	OVE GROUND	☐ FLUSH MOUNT					
Surface Elevation: 1/54. \$1	Feet from Surface	Description of				EEP HOLE - Y / 1		SIAIICY	MAIENTEVEL						
Information in this column to	-						, jestes and,		FEET FR	OM MEASURING POIN					
be supplied in the Feet from						,/ V		DATE OF	STATIC WATER LEV	EL					
Surface column						PROTECTIVE C		ELEVAT	ON OF MEASURING	POINT					
						Type: IS Cond	unde		461.8						
Depth to bottom			75. 18. 18.			RISER PIPE	ent Silvery	1 —	ING POINT IS POFAISER PIP	F					
of Protective Casing Seal:	3.0	C. C.				Length: 77'		От							
	· · · · · ·		П	L		Diameter: 2	ŀ	I	3 EQUIPMENT						
		ಶಲ ಆಪ್					# 2011. KOPV	LI AIR	ROTARY L	J AUGER TYPE					
		Limestone				BOREHOLE DIAMETER:	<i>51/8</i> la.	☐ RE\	/ERSE						
				-		ANNULAR SEA	L	RO'	TARY	OTHER					
						Type: Denton	ate Slurry at Skurry		LIZERS USED AT 4 101	u/.					
						☐ Non SI	urry Bentaarte	1	STAINLESS STEEL						
Depth to Base						BENTONITE SE	1	1	OTHER						
ol Annular Seat	60.0		H	-		Non S	lurry Bentonite // Ft.	MULTIPI	E CASED WELLS						
			-34	-		SECONDARY F	ILTER PACK			L AS BUILT DIAGRA					
Depth to Base of Bentonite Seat:	71.0			1		Type: 📝 Sand	(IsneitqO)	SHOW	ING WELL CO	NSTRUCTION DETAIL					
Depth to Base of Secondary			П	[-		☐Manul Grain Size	lactured n: くつい			D SIZE OF ALL CASINO ND GROUT USED.					
Filter Pack: Depth to Top	14.5		Ц	L		Length:	1.5'	DATE WE	LL CONSTRUCTION	WAS COMPLETED					
of the Screen	14.7			-		PRIMARY FILT Type: Sand			5-21-95	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
						☐ Manuf Grein Size				T THE MONITORING WEL WAS CONSTRUCTED II					
[Length:	12.5	ACCOR	IDANCE WITH TH	E DEPARTMENT OF NAT					
Depth to						WELL SCREEN Length: (C)	,	CONST	RUCTION OF MO	NITORING WELLS.					
9-13	84.7					Slot Size: O		SIGNATU	RE (MONITORING W	ELL CONTRACTOR)					
			-	L			1 BO PVC	PERMIT N	icheut iumber	DATE /					
_			-	L		Length: O. 3F	t t	UO	1786 AIBM						
Plug Back Total Depth						Diameter: 2	in.	SIGNATU	RE (DRILLING CONT	RACTOR)					
Original Total Deptitu	85.3					Type: PVC	FILL SALID	PERMITA	CHOLLY BUMBER	DATE / Crey/					
								اداد	256 VIIV	60345					
EU3 780-1415 (F.94)	,	DISTRIBUTION	WH	TE	CHVISION C	ANARY MONITOR	RING WELL CONTRA	CTOB PIN	K/OWNER	AN, a mark					

		-	-	-	YSTEMS INC.		SOI	L B	ORE	H(DLE	L(OG		ļ	
SITE NAME					TO THE PROPERTY OF THE PROPERT		DRILLING METHOL	k		**************************************		1	ORING N			
							4.25 inch (.D.	/8.25 incl	1 D.D. Hol	aw St	en Auger		PZ-3()2Al		
ſ							3.	625 Inch	Mud Rote	ıry		s	SHET			
							Sampling Metho	O: CALIFO	RNIA SAM	PLER: 2	2.0" I.D. (C	KA:	1 0	& 5	LAYNE-VESTERN	
		1 A	i Di. AV	J/DU2	RI-FS/MO		SPLIT SPOON	2.0 Inch	0.0./1.5 a	ich [.]	, (SP)		DRM	LING	VES	No.
		W	EST (AKE L	ANDFILL		SHELBY TUBE	3.0 inch	0.0./2 13	1/16 in	ch I.D. (Si	12 5	START	FINISH	쌜	
			UPLK	ABLE L	INI; E		WATER LEVEL						THE	TIME	Ϋ́	ĺ
						- 1	TME						B:15	11:30		
N	ORTHI	NG: 1	06721	0.24			CATE						DATE /26/95	DATE 9/26/95		
DATUM E	ASTIN	G: 5	14720	1.49	ELEVATION 450.0		CASING DEPTH		<u></u>				/60/30	9750793	E	
DRILL RIG		E 7:				SU	REACE CONDITIONS		00 7					www.p.s.v.NewVerl.do.	CONTR	-
ANGLE	·		·	BEARING	NA			···-		*********		***				
SAMPLE		t T	·	т.	· · · · · · · · · · · · · · · · · · ·						T	1			2	- 1
DEPTH IN FEET (ELEVATION)	ROW/ 8 N. ON SAMPLER	RECOVERY	SYMBOL	SAMPLER STABOL			NLAMBER ND OF MATERIAL			SAMPLER TYPE			REMAR	¥S	DRILLING	PPPHA decaments
24 	4276 32310 107914	1.6. 6.00 1.5.00	2 d a 4 7 0 0 d 7 0 0 d 1 0 0 d 2 0 0 d 2 0 0 d 3 0 0 d 5 3 0 d 5 3 0 d		(22.0-25.4 ft.) Loase, brown (10YR 6/2), f-r iron staining, NR, wet, (25.4-26.1 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (26.1-37.4 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (26.1-37.4 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (26.1-37.4 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (26.1-37.4 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (26.1-37.4 ft.) Compactory (37 4/1), f-m SAND. t staining, NR, wet, (37 4/1), f	pair s SAI (SP	e yellowish ND with trace P), (ALLUVIUM) Sitve gray e Sit, iron LLUVIUM)	<4	28.0> 22	(1) 42 (2) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4			bbu bi	Þ	943-2848 BY BY B. HARRINGTON	i
E 28	10 12 12	1.0° 2.0° (50%)		X						SP ④					JOB NO:	

	4	A D	AZ		YLY SYNY SYSTEMS INC.	***************************************	SOI	L B	ORE	HC	LE	LOG			
SITE NAM				1 5	- 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1		DRILLING METHOL) .				BORBIG I			
Į							4.25 inch [.D.	/8.25 inc)	PZ3	PZ-302-A					
1							3.	625 Inch	SHEET	SHEET					
							SAMPLING METHO					4> 2 0	2 OF 2		
		L#	\[DLA\	1/DU2	RI-FS/MO		SPLIT SPOON	***************************************					LING	LAYNE-VESTERN	
		١,			LANDFILL UNIT 2		SHELBY TUBE	: 3.0 inch	O.b./2 1:	3/16 incl	n I.D. (SH				
			L, L.	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			WATER LEVEL			<u></u>	<u> </u>	TME	11:30	<u> </u>	
							THE	<u></u>		<u></u>		B-15 DATE	DATE		
	NORTHI	NG: 1	06721	0.24			CASING DEPTH					9/26/95		اہ	
DATUM E		G: :		3.49	ELEVATION 450.0	T		<u> </u>	1	<u></u>				CONTR	
ANGLE	-	112 /		BEARIN	G NA	1 30	RFACE CONDITIONS			-		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		ਨ੍ਹ	
SAMPLE		R				T^-			T-11 - 11 - 11 - 11 - 11 - 11 - 11 - 11					l	
DEPTH (N FEET (ELEVATION)	BLOW/ 6 N.	RECOVERY	STARBOL	SAIPLER SYMBOL		H	NUMBER FD OF MATERIAL	······································		SHAPLER TIPE		REMAI	acs	DRILLING	
	[8 9	1.4'		M	(26.1-37.4 ft.) Compa- olive gray (5Y 4/1),	ct t f-m	o dense, light SANI, NR. wet.							,	
E 31	10 13	(70%)		M	CSP), ČALLÚVIUM)					5P (5)	=			11. 10k	
= 32											ヨ				
32	11 9	1.6,	::::	\prod							=			_ #i	
- 77	10 14	CERTA		H						SP	= 1			HARRINGTON	
<u> </u>	ľ			/\						(6)				ع <u>الإ</u>	
= .				H							7			HARRIN	
34 	16 18	냸;		abla										ρά	
	20 24	KS5Z1		M						CA	= 1				
35	F#									0					
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<u> </u>	7 7	1.2.		\Box							31			7 10/9/95	
Ε	10 14	(£0X)		H						SP	31				
37	114							(4	12.6) 37	.4 B				LOGGED	
E					(37.4-42,0 Ft.) Compa (5Y 4/1), well gradeo						31			999	
38	6	1.3'		17	(SW), (ALLUVIUM)	amp	4D) 141C #E C			H					
E	6 11 11 12	1.3' 2.0' 465x		H						SP	31				
39	12			U						9	=				
_				1							目目				
- 40	10	1.3'		H						\vdash	- 3				
=	14 14 12	13' 20' 865X		M						SP					
41	12			/\						(0)	크				
E		ĺ									= 1		'	848	
<u>- 42</u>				 	End of Call Banchel	1 ==	-+ 420 e+	(4	08.0> 48	.0		0.0 ppm PI	ם	943-284 302AI	
E			1	1	End of Soil Barehole	-08	at 46.0 ft.				31		,	943-	
E-43											크			P.Z	
										11	3)			<u> : </u>	
- 44													:	JOB NO.:	
E	1			1						1 1	=			8 9	
E		1									- -			ا جا	

Well No. PZ-302-AI

Boring No. X-Ref: PZ-302-AI

PIEZOMETER CONSTRUCTION SUMMARY

· · · · · · · · · · · · · · · · · · ·	Survey Coords: Northing: 1067210 ft. Easting: 514720 ft.	***************************************	150.0 ft. NGVD 151.15 ft. NGVD
	Drilling Summary:	Construction Time log: Start	Finish
	Total Depth 43.0 ft.	I I	ime Date Time
	Borehole Diameter 8 1/4" (0.0-43.0')	Drilling	
	Casing Stickup Height 1.15 ft.	CME 750 9/26/95 8	:15 9/26/95 11:30
F10 📓 📓 🖁	Casing Stickup Height 1.15 ft. Driller Layne-Western St. Louis, MO		
		Geophys.Logging:	
	Rig CME 750 Bit(s) 4 1/4" ID Hollow Stem Auger Bit,	Casing:	
	Bit(s) 4 1/4" ID Hollow Stem Auger Bit, 3 5/8" Tricone Bit	2" 1.D. PVC 9/26/95 1	2:50 9/26/95 12:56
	Drilling Fluid Bentonite Drilling Mud (20.0–42.0')		
20			3:05 9/26/95 13:40
	Protective Casing 8x8" Square Steel, by 5' long	Cementing:	
			4:00 9/26/95 14:15
3382 3382	Well Design & Specifications	Bentonite Seal 9/26/95 1	3:40 9/26/95 13:50
-30	Basis: Geologic Log X Geophysical Log	(d)	
	Casing string(s): C = Casing S = Screen	Well Development	
	Depth String(s) Elevation	**************************************	**************************************
	+ 1.15 - 32.60 C1 451.15 - 417.40	astArtichhibitahib	
' = 7	32.60 - 42.40 S1 417.40 - 407.60		
	42.40 - 42.70 C2 407.60 - 407.30		
		Stabilization Test Data:	
111111111111111111111111111111111111111			
		Time pH Spec. Co	ond. Temp (°C)
	Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings		
-50	C2 2" dia. threaded PVC end cap		
	(4" long or 0.33')		
- Caramana - Caramana	Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine cut slot, flush threaded with O-rings		
***************************************	MANUAL PROPERTY OF THE PROPERT	**************************************	
-60	Sand Pack: 16-35 mesh Silica Sand 27.9-43.0'	Recovery Data:	
	Filter Pack: 100 mesh Silica Sand 27.0-27.9'	100	
	Grout Seal: Wyo-Ben Grout Well Bentonite Slurry	80 70	
	3.0~23.0'	80 50 50 40	
-70	Bentonite Seal: Extra high yield Wyo-Ben (100%)	* 30	
	Slurry 23.0-27.0'	20	
100	Concrete: 0.0-3.0'	0 20 40 6	90 80 100
Tanahara aya aya aya aya aya aya aya aya aya		TIME (Minutes)	
	Comments:		
1-80	***************************************		
Not to Scale	Supervised by B. Harrington Site	LAIDLAW/OU2 RI-FS/MO	
,	Job Number 943–2848 File Name	PZ302AI	



MISSOURI DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGY AND LAND SURVEY

MONITORING WELL

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145100	
C.Fl. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED

	CERTIFI			ORD		АРРЯС	OVED 8	Y .		F	ENTERED						
INFOR	MATION SUPPLI	FDBY	MONITOR	NG WEI	LCONT							Ph 1		²h 2	Ph 3		
	LITY NAME	LUUI	MONTON.	III II II	-E COILLI		L NUMI	ВЕЯ									
SITE ADDI	NAW BRIDG	ETUKI	5AU 17	TARY	LANDFIL	4 1	PI-	3DZA	I								
	CHARLES PU	er G	2p.		CITY	Ве	i De	ETON	•		STA	те Мо		ZIP COD)∈ 5044		
OWNER N.	AME .				-			- 1014			TEL	EPHONE			- 		
OWNER A		> 5	TEMO, I	HC.	CITY							314-					
1	B N. BROAD	YAW			Citt	ST.	Louis				STA	™		ZIP CODE 63 102			
VARIAN	CE YES DAT	E ISSUED	***************************************				roc	ATION C		L,	·		OUNTY		Louis		
ISSUED	NO VAR	ANCE NU	мвея: V	TI ANT. 4		···		W LOCATI FION PLAT			SURF	ACE ELE			50.0		
	E LOCATION OF TH					-	圧		Section 1995	- n	500						
	S' INISIDE FEN		,			=			SMALL	EST ¼				L	ARGEST 1/4		
	DOM ENTRAK DOK RD.	ice c	OFF OLD	<u>57. CHA</u>	PLES	 -	註			% _		_% _		_1/4 _			
									SEC			47	N,RN	J	<u>5</u>		
							LAT.	<u> 38</u> .	<u>45</u>	52	LC	ong9	<u> </u>	26	54.		
i	ORING WELL IN		ATION		\.			<u> </u>			PEF	RMIT					
	ACTOR'S NAME			LAYNE	WES	TER	N	La, In	<u>IC.</u>		+-	MBER	تر	1125	SS WPM		
NAME	NG CONTRACTO	JH 2		LAYNE	E WES	TER	N (ربر اد	jÇ.			RMIT MBER	00	125	MPM E		
				WELI	CONST	RUCT	ION	NFORM						~·····			
TYPE OF	MONITORING PIEZOMETER	WELL	TYPE OF	سمد ا⊽اً۔	ZARDOUS	MATE!			- 1	NITORING V.O.C.		HECK ALL T					
WELL	OTHER		TIAL SIT	<u> </u>	S.T.		INCH		_			EIALS		NLY	UM PRODUCT		
PRO- TECTIVE CASING	LENGTH	DIAMETEI CASING	R OF WEIGHT (DEPT	TER AND JOI			THA		MATERIAL		HERMO PL			NG CAP?		
DETAILS (IF USED)	5 гт.	8×8	IN. 0.186	3" 3		OTHER		L 🗆 WEL	DED	TYPE	L L I FI	LUORO PO	LYMER	ZY YE	s ∐ no		
	CAP VENTED YES NO	CASING	MATERIAL CEMEN	ar .	DEPTH FRO	TOM OF	THE	TYPE OF	[X] AE	BOVE		DESCRIBE	HOW TH	LE FLUS	H MOUNT WAS		
	WEEP HOLET	GROUT	IN course		CASING GR	L 🦟	SURFACE	=	GROUN) ^{Aşaşırı}							
	☑ YES ☐ NO		OTHER	l	3.		FT.	TION	1	MOUNT							
CENTRALIZ ON RISER	ERUSED 🔀 NO	LOCATED				MATE □ S		ESS STEE	:	THER							
RISER	LENGTH	DIAI	METER OF ER PIPE	WEIGHT		HETER O	F	JOINTS		⊠ тнпа	ADED	MATERIAL	Z	THER	MO PLASTIC		
PIPE DETAILS	34.2	FT.	_	N. SCH		il hole 874	MECHANICAL WELDED STEEL FLU							RO POLYMER			
	CEMENT SLU	RRY			NITE SLURR		41,	MATERIAL				OTHE		ENTONI	TE SEAL		
ANNULAI SEAL	BENTONITE S	LURRY	BAGS CEME	OF ENT USED .			ONITE	BENTO		П	1	SEAL	11	ISTALLE	ED IN ATURATED		
	TYPE:	BENTUNI	" % BEI	NTONITE U		35	AL	SLUI		CH PEL		4.0	.	zo	INE		
PRIMARY	TYPE X SAND	1	GRAIN SIZE	LENGTH (00 OF			tion in this	FEET		14	Y SATU	JRATED ZONE		
FILTER PACK	MANUFACTU	RED	16-35	15	, l FT.	Ι.	LLATIC		supplied from Su	In the Feet	FROM	a	F	ORMAT ESCRIP	TION TION		
			GRAIN SIZE	LENGTH C		METH	OD OF	OUR	column								
SECONDAI FILTER PACK	SAND MANUFACTU	яED	10-	PACK	a		LLATIC			bottom of		0-	15 5	»: l † y	clay		
	LENGTH OF SCREE	N I	DIAMETER	O.	WEIGHT OF			SUR	Seal:		3.0						
WELL SCREEN	1				SDA#		ASTIC				**********	_ IS-: 	43 5	5ilty	sand		
	LENGTH OF SUMP	FT.	2. IN.	10	SCH BU			POLYMER	Annular	Base of Seal:	23.6	2					
SUMP DETAILS]	315ME1E1101 31	Δ <i>i</i> ii3·	☐ PVC		STEEL										
	WAS THE WELL BAC				FLUOR OTHER				Depth to Benionit	Base of Seal:	27.0	>					
BACK	FILLED?	MATERIAL USED	F BACI E	K FILL	ED	Depth to	Top of Filter Pacic	22	.								
FILL	LI YES KI NO								27.9	_							
STATIC WATER LEVEL FEET FROM MULTIPLE CASED WELLS SCREEN: 33.0																	
DATE OF ST	ATIC WATER LEVEL		CONSTRUCT	ION DETAIL!	S INCLUDING S, AND GROUT	TYPE A	NO SIZ	E OF ALL									
MEASURING	POINT FOR STATIC WAT RISER PIPE	EA LEVEL (IS DAILLING EC	UIPMENT	AUGER TY		.1/A 1	H. 5.A	Depth to	Bottom of	430						
OTHER			L AIR RO			PE <u>I</u>	/** ¹		Total De	plh:	43.0	2					
	OF MEASURING POINT 451-15		REVERS	Y	OTHER						NG WAS	COMPLETE					
HEREBY	CERTIFY THAT TALL RESOURCES	THE MO	NITORING	WELL HE	REIN DES	CRIBE	D WA	S CONS	TRUCT	ED IN A	CCOR	DANCE	WITH	THE D	EPARTMENT		
SIGNATURE	PRIMARY CONTRACTO			DA	TE	s		URE DRILLE			•		****	DATI			
7/m	u XI. Maha	3 <i>[Y</i>	<u> </u>		11-15-4:	5	(un)	an V	211a	hurin	h.			1	1-15-95		

MO 780-1415 [7-95]

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR SUK/OWNER MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402 ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

	SOIL BOREHOLE LOG													
SITE NAME AND LOCATION							DRILLING METHOD:						BORING NO.	
1							4.25 inch I.D.	/8.25 inch	O.D. Hou	ow Sten	Auger	PZ-30)2-AS	
												SHEET		R.
l							SAMPLING METHOD: CALIFORNIA SAMPLER: 2.0" (.D. (CA)							LAYNE-VESTERN
LAIDLAW/DUZ RI-FS/MD							SPLIT SPOON: 2.0 inch 0.0./1.5 inch 1.0. (SP) SHELBY TUBE: 3.0 inch 0.0./2 13/16 inch 1.0. (SH)					DRILLING		-VE
VEST LAKE LANDFILL DPERABLE UNIT 2											1.0. (SA)	START	FINISH TIME	Z NE
							THE	18 FT.				l1:45	14:35	2
-						ľ	DATE	9/25/95	<u> </u>		+-	DATE	DATE	
NDRTHING: 1067197.73 DATUM EASTING: 514737.29 BLEVATION 449.5						Casing Depth	20 FT.				9/25/95	9/25/95	2	
DRILL R		IE 75	iO			SUI	OFACE COMOTIONS					the state of the s		CONTR
	90"			BEARING	NA		**************************************			**************************************			· · · · · · · · · · · · · · · · · · ·	1
SAMPLE	HAMME	R T T				<u> </u>			·····					200
GEPTH IN FEET (ELEVATION)	BLOW/ 6 M. OH SAMPLER	25	성	SALPLER SYMBOL	SA	NUMBER			FE S				DRILLING	
1 24	SAMPLE SA						OF MATERIAL					REMARKS		۵
P	© 88 c " §									ST CARS				
	<u> </u>													
E	5 7 5 5	1.6' 같.0'		M	(0,0-1.5 ft.) Compact, orange (5YR 6/6), CL	AYEY	SILT, Fine				31	•		4 1
= 1	5	(80%)		H	Gravel sized pebbles,	, KFIL	-L>			SP				z
					(1.5-15.0 ft.) Loose, o (5Y 4/1), SILT, NR, dr			er-		0	31			TII. TON
= 2	١,			 	mixed fill to 2.5 ft.	(SM),	(LOESS)				= 1			l ii
E	45556	1.5° 20° 675X)		M							31			
<u> </u>	6			Λ						SP	크ㅣ			HARRINGTON CHK'D BY
F				\mathbb{H}	@ 3.5 Ft. damp					®				HARRIN
- +	1	1.7			·						-=	0.0 ppm PI))	± 5
E		1.7° 2.0° KBSX)		M						TZ	引			
5	1		ŀ	Π						3	=			
E				Ц							引			15
1 2 2 · · · · 3 · · · · 4 · · · · · · · · · ·	1	<u>1.9'</u>		H										IQ/9/95
	1 2	K42K)		M	@ 6.7 ft, maist					SP	31			ш
= 7	2			Π						④				LOGGED
= _				Ц							= 1			LOGG
	0	(95%) 2.0' 1,9'		П							目			
E	0001	(95%)		M						sp	= 1			
	ľ			Λ						(5)				
E 10	1										三二	0.0 ppm PII	y I	
F "	l e	1.4' 2.0' (70%)		M							= 1	ne bhu		
E	ខេត	(70%)		M						SP	三三			1 1
= ''					from 11.5-11.7 ft, we	+				(6)	=			<u>g</u>
E 12	1.				From 11.7-13.1 ft., noi	st					耳			S 29.
8 9 10 11 11	1 5 1	2.0° 2.0° 0.80°									目			943~2848 P2302AS
E 13	14	CISORX		M						SP	<u> </u>			PZ
• •	1			/ 1	From 131-13.6 ft, we					0	31			<u>ن</u> ن
F-14					From 13.6-15.0 ft., mo	ist					_=			JOB NO.: FILENAME:
É 14	5	(60%) 5.0, 1.5,		H						SP (S)	31			88 ==
L	Jă	rougi	Ш							(8)				- 14

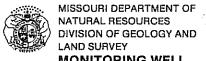
SITE NAM		LA V	IDLAV	ABTE 1	RI-FS/MO LANDFILL UNIT 2	DABLLING METHO 4.25 inch I.D. SAMPLING METHO SPLIT SPOUN SHELBY TUBE WATER LEVEL TIME DATE	0: /8.25 inch 00:CALIFO 1 2.0 inch	O.D. Hollo	ow Ster LER: 2: ch I.D.	Auger of I.E. (CA (SP)	ORM	2-AS : e	LAYNE-WESTERN
DATUM E	ORTHI ASTIN	NG: 1 G: 5	06719 14737	7.73 7.29	ELEVATION 449.5	CASING DEPTH	20 FT.				9/25/95	9/25/95	Æ
DRILL RIC		E 75				SURFACE CONDITIONS		·			/////////////////////////////////////		CONTR
ANGLE SAMPLE		3		BEARW	G NA			······································	·*************************************				
OEPTH IN FEET (CLEVATION)	BLOW/ 6 PM. ON SAMPLER	1	SMBOL	SAMPLER SYMBOL		LE NUMBER AND ON OF MATERIAL			SAMPLER TIPE		REMAR	KS	DRILLING
16 	_986 ⊷959 9594 GG-18	7.0. 2.0. 2.0. 2.0. 2.0. 2.0. 2.0. 2.0.			(15.0-21.9 ft.) Laose, of (5Y 4/1), medium SAND, (SY 4/1), medium SAND, (SP).(ALLUVIUM) from 19.2-21.0 ft., tracin Sand (21.9-24.0 ft.) Laose, d brown (10YR 6/2), f-m staining, NR, wet, (ALLU	ork yellowish SAND, little ron	(24.0) 24.	A (1) A		0.0 ppm PII 0.0 ppm PII		LOGGED BY B. HARRINGTON DATE 10/9/95 CHKYD BY B. TILTON
22 - 23 - 24 - 25 - 26 - 27 - 28 - 29				ika mikatan manan manan manan manan manan manan manan manan manan manan manan manan manan manan manan manan ma					AND THE PROPERTY OF THE PROPER				JOB NO.: 943-2848 FILENAME: PZ302AS

Well No. PZ-302-AS

Boring No. X-Ref: PZ-302-AS

PIEZOMETER CONSTRUCTION SUMMARY

	Survey Coords: Northing: 1067198 ft. Easting: 514737 ft.	Elevation Ground Level Top of PVC Casing	449.5 ft. NGVD 451.42 ft. NGVD
	Drilling Summary:	Construction Time log:	
-10	Total Depth 22.3 ft. Borehole Diameter 8 1/4" (0.0-22.3") Casing Stickup Height 1.92 ft. Driller Layne-Western St. Louis, MO Rig CME 750 Bit(s) 4 1/4" ID Hollow Stem Auger Bit	Task Date Drilling CME 750 9/25/95 Geophys.Logging: Casing: 2" I.D. PVC 9/25/96	Art Finish Time Date Time 11:45 9/25/95 14:35
-20	Drilling Fluid None Protective Casing 8x8" Square Steel, by 5' long	Filter Placement: s/25/95 Cementing: Development Bentonite Grout	16:00 9/25/95 15:40
-30	Well Design & Specifications Basis: Geologic Log X Geophysical Log Casing string(s): C = Casing S = Screen	Bentonite Seal 9/25/95 Well Development	15:40 0/25/85 15:60
	Depth String(s) Elevation + 1.92 - 12.20 C1 451.42 - 437.30 12.20 - 22.00 S1 437.30 - 427.50 22.00 - 22.30 C2 427.50 - 427.20	Stabilization Test Data:	
-50	Casing: C1 2" dia. Schedule 80 PVC, flush threaded with O-rings C2 2" dia. threaded PVC end cap (4" long or 0.33') Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine	Time pH Spec.	Cond. Temp (°C)
-60	cut slot, flush threaded with O-rings Sand Pack: 16-35 mesh Silica Sand 9.9-22.3' Filter Pack: 100 mesh Silica Sand 9.0-9.9'	Recovery Data:	
-70	Grout Seal: Bentonite Seal: Extra high yield Wyo-Ben (100%) Slurry 3.0-9.0' Concrete: 0.0-3.0'	90 80 70 80 80 50 40 30 20 10 0 20 40	50 80 100
-80	Comments:	TIME (Minute	25)
Not to Scale	Supervised by B. Harrington Site Job Number 943-2848 File Name	LAIDLAW/OU2 RI-FS/MO PZ302AS	



OFFICE USE ONLY	DATE RECEIVED	
REF. NO. 145099		
G.R. NO	CHECK NO.	
STATE WELL NUMBER	TRANSMITTAL NO.	
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SITE/FACIL	ITYNAME LAW BRIDG	5ETUNI	SANITA	RY LA	NDFILL	- 1	L NUMB PZ	ier 1-301	245						
SITE ADDR	ESS .	•			CITY				<u></u>			STATE		ZIP CODE	
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OWNER AD					CITY	-	1					STATE		ZIP CODE	
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ENT	Parice off	OrD 5	T CHARLES	POCK	RD,			 		%			*****	<u></u> ¼	
			***************************************						SEC	7	TWN.	47	7N,A	NG	5(E)DR W
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NAME			[_A\]		CONSTR				ATION	J	11	NUMBE	R L	01258	WIFT
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OF WELL	☐ PIEZOMETER ☐ OTHER	l	POTEN- TIAL SITE	IX LAN		□ o.	THER			V.O.C.		META	LS 🗆 F	ETROLEL ONLY	JM PRODUCT
PRO- TECTIVE	LENGTH	DIAMETE	ER OF WEIGHT O		TER AND JOH	NTS		☐ THRE		MATERIA] тнея	MO PLASTI		G CAP7
CASING DETAILS (IF USED)	5 _{FT.}	8×8		. 99	TOTE IN	MECH.		. 🗆 WELI		X STE	EL C] FLUO	RO POLYME	P 🗵 YES	; □ №
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	▼ YES □ NO		OTHER		3.0		FT.	TION		MOUNT	Γ				
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SECONDA	TYPE		GRAIN SIZE	LENGTH O	F FILTER		IOD OF						0-15	siliy c	lay
FILTER PACK	MANUFACTI	URED	100	0.0	ो гт.			POUR	Protecti Seal:	ballom o ve Casing	" 3,				•
15751 1	LENGTH OF SCRE	EN	DIAMETER	SLOT SIZE	WEIGHT OR		HIAL								
SCREEN	10	FT.	2 IN.	ΙO	SCHBO	□ s	TEEL	POLYMER	Depth to	Base of Sent:	9.	2			
SUMP	LENGTH OF SUMP		DIAMETER OF S	ЛМР	MATERIAL PVC		STEEL								
DETAILS					FLUOR	O POL			Depth to Bentocil	Base of	9.0	_			
	WAS THE WELL BA	CK	MATERIAL USED		LI OTHER LENGTH C	F BAC	K FILL	ED	Depth to		1	<u></u>			
BACK FILL	YES NO	,			BONE HUL	-E			Primary	Filter Paci	<u> </u>	9			
STATIC WAT		FROM URING POI	MULTIPLE C						Depth to Screen:	Top of th	12				
DATE OF ST	ATIC WATER LEVEL		CONSTRUCTI CASING, HOLI	ON DETAILS	INCLUDING	TYPE /	SHOW SIZ DNA	ING WELL ZE OF ALL					15-22,3	Silty	sand
	POINT FOR STATIC WA	ATER LEVE	IS DRILLING EC	UIPMENT			1/4 11	-4, Δ	Depth to the Scre	Batlam c	1 22	1,3			
OTHER	1		AIR RO	_		PE L	<u> 194</u> Н	· ~~.	Total De	plh:	22	2.3			
	OF MEASURING POINT		L REVERS	Y	OTHER				DATEW	ELL DRIL	LING V	25.9	IPLETED S		
	Y CERTIFY THAT								STRUC	TED IN	ACC	ORDA	NCE WIT	H THE D	EPARTMENT
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X W 1621 MO 780-1415	(3) //ahuji		TRIBUTION: "		11 - 15-93			lan X	Mal	letin	И.	/D)/		1	1-15-95
MU /80+1415	(1+93)	ry uis	TRIBUTION: Y	rni 12/UIVI;	SUN CANA	·HT/MC	NUTOR	ONG WELL	CONTRA	ACTOR	PINK	OWNER	1		B HOURSENS

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	4	_		-	LA LU		SOI	L B	ORE	HO	LE	LOG			
SITE NA				<u> </u>	101000 110.		DRILLING METHO):				BORNG !			
							4,25 inch I.D	/8.25 inc	h C.D. Hol	law Ste	n Auger	PZ-3	03-AS		
						-	,					SHEET		Z	!
						-	SAMPLING METH		***************************************				F 2	LAYNE-VESTERN	•
					RI-FS/MO	ļ	SPLIT SPOON						LING	Ž	3
				LAKE L LABLE U	ANDFILL INIT 2	-	SHELBY TUBE	: 3.0 inch	, 0'D'\S 1:	1/16 Inch	1 I.D. (SH	START TIME	FINISH	Ž Ž	
						ŀ	TIME		_		_	16:45	8:45	إد	ł
					•	ŀ	DATE		╂	 	1	DATE	DATE		:
DATUM	NORTHI				ELEVATION 450.8	ŀ	CASING DEPTH		 	 		10/4/95	10/5/95	02	
DROLL R	Minchelly arrangement of the Publish Street, or other Publish Street, o	E 75		J.J.	MALETATON TAUTO	SUR	FACE CONDITIONS	<u> </u>	1	L			<u> </u>	CONTR	- Constitution of
ANGLE	90*			BEARING	NA									8	,
SAMPLE	HAMMET	₹												ဗ	- 1
DEPTH WH FRET (ELEVATION)	BLOW/ 6 IN. ON SAMPLER	RECOVERY	SWBO.	SAMPLER SYMBOL		AN	NUMBER ID OF MATERIAL			SALPLER TYPE		REMAI	жs	DRILLING	;
1 2 2 3 4 5 5 5 5 6 5 6	3579 7748 2355	- INO 68 25 25 25 25 25 25 25 25 25 25 25 25 25			(0.0-3.1 ft.) Compact, brown (10YR 5/4), SIL (FILL) (3.1-4.6 ft.) Compact, (5Y 4/1), SANDY SILT, (LDESS) (4.6-7.4 ft.) Loose, of Fine SAND, trace Sit, (ALLUVIUM)	olive	gray (SY 4/1),		46.2) 4	\$\frac{1}{3}		0.0 ppm P	ID	ri .	CHK'U BY
9 	1797	1.5° (95%) (95%) (85%)			(7.4-12.2 ft.) Loose, (SAND, NR, moist, (SP),					\$P (4) \$P (5)		Faint pet oder 8 7	.4 Ft.	LOGGED BY	
11 12 13	NNAN 3678 655	18.00 CARCO 18.00		X X	(12.2-26.0 ft.) Compac dark gray (N4), f-m (ALLUVIUM)	ct to SAND	o dense, medium j, NR, damp, (SP	j.,		25° (3) (3) (3) (3) (3) (3) (3) (3) (3) (3)		Strong p adar		JOB NO.: 943-2848	FILENAME: PESUSAS

					YLYJYIY BYSTEMS INC.		SO	IL	В	ORE	EHC)LE	LC)G			
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						ŀ	SAMPLING METH	<u> </u>	-,,,-,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	*****			 		. ε 5	₹.	ĺ
						ŀ	SPLIT SPOOM			0 n 715 a	wh th	7557		***************************************	LING	LAYNE-VESTERN	
					RI-FS/MD LANDFILL	ŀ	SHELBY TUB						4) 6	TART	FINISH]	
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						<u>}</u>	DATE	}			 			ATE	DATE		
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SAMPLE			***************************************													ŧ	
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Well No. PZ-303-AS

Boring No. X-Ref: PZ-303-AS

PIEZOMETER CONSTRUCTION SUMMARY

****		1	Survey Coords: Northing: 1067763 ft. Easting: 514426 ft.	Elevation Grou Top of PV		-	t. NGVD It. NGVD	
_	8 8	ļ	Easting: 514426 ft.	TOPOLEV	Cesing	453.16	n. Wavi	
·O			Drilling Summary:	Construction T	-			
						Start	4	nish
		Ш	Total Depth 26.5 ft.	Task	Date	Time	Date	Time
			Borehole Diameter 8 1/4" (0.0-26.5')	Drilling			w	
			Casing Stickup Height 2.38 ft.	CME 750	10/4/85	16:45	10/5/95	8:45
-10			Driller Layne-Western					
10			St. Louis, MO					
				Geophys.Logging	g:			
			Rig CME 750	Casing:		***************************************		
			Bit(s) 4 1/4" ID Hollow Stem Auger Bit	2" I.D. PVC	10/5/95	9:00	10/5/95	9:05
								1
			Drilling Fluid None					
-20				Filter Placement:	10/5/96	9:05	10/5/95	9:55
	<u> </u>		Protective Casing 8x8" Square Steel, by 5' long	Cementing:				
			- As a safe're a destable of the property of the body of the safe	Development	***************************************	A	***************************************	M. Mahaja (M. Alan da A.
			<u> </u>	Bentonite Grout	10/5/95	10:15	10/5/95	10:20
	<u>[</u>		Well Design & Specifications	Bentonite Seal	10/6/95	9:66	10/5/95	10:05
			Bacin Castoria Lea V Gasabysiani Las				,	
-30			Basis: Geologic Log X Geophysical Log	Mall Daneley		 	· · · · · · · · · · · · · · · · · · ·	
			Casing string(s): C = Casing S = Screen	Well Developm	ent			

			Depth String(s) Elevation		utsinaisensaisitei esiminei vinamanaisini-e	منافة المناملية والمراملة بالمناورة والمارية		
			+ 2.38 - 16.00 C1 453.18 - 434.80		····			
****			16.00 - 25.80 S1 434.80 - 425.00					
,			25.80 - 26.10 C2 425.00 - 424.70					
			**					
			**	Stabilization T	est Data:			
				Time pH	Spec	. Cond.	Тел	1p (°C)
		1 1	Casing: C1 2" dia. Schedule 80 PVC,			***************************************		
			flush threaded with O-rings			+		
-50			C2 2" dia. threaded PVC end cap		***************************************			~
			(4" long or 0.33')			************		***********
			Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine					
			cut slot, flush threaded with O-rings				l	
			cot slot, hour threaded with G-111gs				***************************************	
			Sand Pack: 16-35 mesh Silica Sand 12.6-26.5'	Recovery Data	ı <u>.</u>			
~60			Carried a section 1 to the section of the section o	1.00010.)	,,,			
			Filter Pack: Less than 50 mesh Silica Sand	100			T-1	
			11.8-12.6'	80				
			Grout Seal: Wyo-Ben Grout Well Bentonite Slurry	4.4	 	 -		+
			3,0-8.0'	RECOVERY 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				
~70		1				╂╼╌╂╌		1-1
			Bentonite Seal: Extra high yield Wyo-Ben (100%)	30				
			Slurry 8.0~11.8'	10				+
			Concrete: 0.0-3.0'	0	0 40	60	80 1	<u>ο</u> φ
					TIME (Minu	test		
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	Not to Scale		Supervised by B. Harrington Site	LAIDLAW/OU2 RI-F	S/MO	advenment side demokrateratura		
			Job Number 943-2848 File Name	PZ303AS				



MISSOURI DEPARTMENT OF NATURAL RESOURCES DIVISION OF GEOLOGY AND LAND SURVEY

OFFICE USE ONLY	DATE RECEIVED
REF. NO. 145101	
C.R. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED
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CERTIFICATION RECORD APPROVED BY ENTERED Ph.1 Ph.2 Ph.3		, manual (manual)		OUTE	r.c			CHECKED BY			ELL	G W	TORING	MONI	*******
INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR SITEFACILITY NAME (AIDLAW 都BZIDGETON SANITARY LANDFILL P2-303A3) STATE ADDRESS ST. CHARLES ROCK CD BRIDGETON MO GOLDA GO					Eř		Y	APPROVED B		RD	RECO	ION	IFICATI	CERT	
LAIDLAW #BRIDGETON SANITARY LANDFILL P2-303A3 SITE ADDRESS ST. CHARLES ROCK RD CITY BRIDGETON Mo 63044 OWNER NAME LAIDLAW WASTE SYSTEMS, NC. OWNER ADDRESS 1839 N. BROADWAY ST. LOUIS VARIANCE YES ISSUED NO VARIANCE NUMBER: V DESCRIBE LOCATION OF THE WELL SO WE WOULD BE ABLE TO VISIT IT AT FENCE LINE, 360 HORTH OF SOUTHWEST FENCE CURNERS MONITORING WELL INSTALLATION CONTRACTOR'S NAME LAYNE WESTERN Co., NC. WELL CONSTRUCTION INFORMATION TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING WELL TYPE OF MONITORING FOR (CHECK ALL THAT APPLY) WELL CONSTRUCTION INFORMATION WELL CO. M. C. M. C. M. C. M. C. M. C. M. C. M. C. M. C.	3	Ph 2 Ph	² h 1		<u></u>	····		ACTOR	CONTR	G WEL	NITORIN	у мс	PPLIED BY	ATION SUI	INFORM
STATE ADDRESS ST. CHARLES ROCK RD STATE S						3			OFILL.	LAN	JITARY	50	IDGETON		
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MO 780-1415 (7-95)

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINCOWNER
MAIL WHITE COPY TO: DEPARTMENT OF NATURAL RESOURCES, P.O. BOX 250, ROLLA, MO 65402
ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 50 DAYS AFTER WELL COMPLETION

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DEPTH IN FEET (BLEVATION)	22	Z		SAMPLER STABOX						3			
1				1/1							\		
= 1					(39.3-46.0 ft.) Compa gray (5Y 4/1), f-m S	ct to	dense, alive			SP		0.0 ppm l	PID
: ,			::::		(ALLUVIUM)	26.11.4#23 4	110 HC 63 101 13	4 4	05.6) 46	.0			
- 46	3	5:0, 1:5,	.	V	(46.0-48.4 ft.) Loose (5Y 4/1), well graded						日日		
47	5	(60X)		M	Gravel, NR, wet, (SW)	, CALL	UVIUM)			SP	= 1		
- 47	3						•			10	31	-	
<u> 48 </u>	€ .	1.3′		7				(4	03.2) 48	4	目目		
	€ 12 17 15	(65%) 2.0'	::::	H	(48.4-50.0 ft.) Compa (5Y 4/1), f-m SAND,			and		SP	31		
- 49	.5				fine Gravel, NR, wet,					111	= 1		
- 1									101.6) 50	ا ا	31		
_ 50					End of Soil Borehole	Log	at 50.0 ft.	Management - 1			4	0,0 ppm i	L19
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_ 51													-
52											=		
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Well No. PZ-304-AI

Boring No. X-Ref: PZ-304-AI

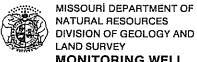
PIEZOMETER CONSTRUCTION SUMMARY

		Survey Coords: Northing: 1068126 ft.	Elevation Ground		it. NGVD
5 5		Easting: 514435 ft.	Top of PVC C	asing 454.02	tt. NGVD
		Drilling Summary:	Construction Time	∍ log: Start	Finish
		Total Depth 50.0 ft.	Task	Date Time	Date Time
		Borehole Diameter 8 1/4" (0.0-50.0')	Drilling		
		Casing Stickup Height 2.42 ft.	CME 750	10/2/95 8:00	10/2/95 14:15
-10 🔘 🔘		Driller Layne-Western			
	CIED	St. Louis, MO			***************************************
	COLLECTED	Dia Otte 70 Delegand Delegatil TOOM!	Geophys.Logging:		
		Rig CME 75, Schramm Portadrill T660H Bit(s) 4 1/4" ID Hollow Stem Auger Bit	Casing: 2" I.D. PVC		
	SAMPLES	3/8" Tricone Bit	2 1.0, FVQ	10/2/95 14:20	10/2/95 14:25
	*	Drilling Fluid Bentonite Drilling Mud (23.0-50.0')		**************************************	Professional American
-20	9		Filter Placement:	10/2/95 14:25	10/2/95 15:10
		Protective Casing 8x8" Square Steel, by 5' long	Cementing:		
			Development		
		Well Design & Specifications	Bentonite Grout Bentonite Seal	10/2/95 15:45 10/2/95 15:15	10/2/95 16:45 10/2/95 15:20
			DOMO: MO OCE	1016130 13.10	10/2/95 15.20
-30		Basis: Geologic Log X Geophysical Log	\$ b x . ex		**************************************
		Casing string(s): C = Casing S = Screen	Well Developmen	Į.	
		Depth String(s) Elevation		and the same of th	
922 980	, ,	+ 2.42 - 39.00 C1 454.02 - 412.60		***************************************	de d'Alexandri d'Alexandri d'Arrich d'A
	1	39.00 - 48.80 S1 412.60 - 402.80		# }}	**************************************
		48.80 - 49.10 C2 402.80 - 402.50			······································

_		134-1440(1940-194)	Stabilization Test	Data:	

		Casing: C1 2" dia. Schedule 80 PVC,	Time pH	Spec. Cond.	Temp (°C)
50		flush threaded with O-rings			
30	1	C2 2" dia. threaded PVC end cap			
1		(4" long or 0.33')			
erma producery.	1	Screen: S1 2" dia. Schedule 80 PVC, 0.010" machine			
d'A reference	į	cut slot, flush threaded with O-rings			
approximate and a second		Sand Pack: 16-35 mesh Silica Sand 36.5-50.0'	Recovery Data:		
60	- 1	10 00 1110011 011100 00110 0010	ricoovery Data.		
Practical delication of the control	- 1	Filter Pack: 100 mesh Silica Sand 35.9-36.5'			
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and the state of t	- 1	Grout Seal: Wyo-Ben Grout Well Bentonite Slurry	20		
	i	3.0-32.0'	£ 50		
70			볼 4이		
		**************************************	30		
P. Merrelle and		Slurry 32.0-35.9'	10		
Perceione	İ	Concrete: 0.0-3.0'	O 20	40 60	80 100
the second	-		TIMI	E (Minutes)	Patrick and the control of the Annual to
80	ļ	Comments:	······································		
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		TOTAL CONTRACTOR CONTR			

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Not to Scale		Supervised by B. Harrington Site	LAIDLAW/OUZ RI-FS/MC)	
		Job Number 943–2848 File Name	PZ304AI		



OFFICE USE ONLY	DATE RECEIVED
REF, NO. 145103	
C.A. NO.	CHECK NO.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	ROUTE
APPROVED BY	ENTERED

INFORMATION SUPPLIED BY MONITORING WELL CONTRACTOR CALDLAN SCIPGE TON SANITARY VANISHED P. 304A I		CERTIFICAT		ORD	1	APPRO	OVED BY			NTERED			
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CENTRALIZER USED	l !				3.0	ŧ		TION	LL FLUSH				····
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CASING, HOLE DIAMETERS, AND GROUT USED. CASING, HOLE DIAMETERS, AND GROUT USE	DATE OF STATIC		ISUUMII AU	DITIONAL AS	BUILT DIA	GRAM	SHOWIN	G WELL					
I TOP OF RISER PIPE ☐ AIR ROTARY ☐ AIR ROTARY ☐ AIR ROTARY ☐ AIR ROTARY ☐ AIR ROTARY ☐ AIR ROTARY ☐ AIR ROTARY ☐ OTHER ☐ COLUMN	MEASURING POR	NT FOR STATIC WATER LEV	CASING, HOL	E DIAMETERS, A	ND GROUT L	USED.							
ELEVATION OF MEASURING POINT REVERSE ROTARY DATE WELL DRILLING WAS COMPLETED 1C-02-95 I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. SIGNATURE PRIMARY CONTRACTOR/PERMIT DATE SIGNATURE DRILLER/PERMIT DATE 11-15-95 Jaman J. Maluri, 1. 11-15-95	区 TOP OF RU				UGER TY	_{PE} 4	1/4 4	5.A.	the Screen:	50.0	<u> </u>		
16-02-95 I HEREBY CERTIFY THAT THE MONITORING WELL HEREIN DESCRIBED WAS CONSTRUCTED IN ACCORDANCE WITH THE DEPARTMENT OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. SIGNATURE PRIMARY CONTRACTOR/PERMIT DATE 11-15-95 TOTAL LIFE SIGNATURE DRILLER/PERMIT 11-15-95 TOTAL LIFE SIGNATURE DRILLER/PERMIT 11-15-95	ELEVATION OF A		REVER	_								<u> </u>	
OF NATURAL RESOURCES REQUIREMENTS FOR THE CONSTRUCTION OF MONITORING WELLS. SIGNATURE PRIMARY CONTRACTOR/PERMIT DATE SIGNATURE PRIMARY CONTRACTOR/PERMIT DATE 11-15-95 TOMAN J. Majuring. 11-15-95	4	54.02	ROTAR	ΙΥ			-D 1112	0.00				10-02	
SIGNATURE PRIMARY CONTRACTOR/PERMIT * DATE SIGNATURE DRILLER/PERMIT * DATE 11-15-95 Zoman D. Mahuri J. 11-15-95	OF NATURAL	L RESOURCES REQI	JIREMENTS F	OR THE COM	NSTRUCT	LION LION	OF MO	SAUU 6 IROTIN	ING WELLS.	AUCOF	IDANCE V	WITH THE I	DEPARTMENT
Communication of District Communication of the Comm				DATE						, 1.			
	MO 780-1415 (7-95	1) IIValin M	STRIBUTION:	WHITE/DIVISION	1-15-9	5 Z	ZOW	IAM -	ONTRACTOR	U.H.	NER		1-15-95

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR PINK/OWNER
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ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

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	4		4/		A A A A A A A A A A A A A A A A A A A		SOI	L B	OF	REH	10	LE	LOG	;	
SITE NAM				TAG IS	Oldicas mo.		DRILLING METHOC):					BORING		
						_	4.25 Inch 1.D./	'8.25 inch	2 O.D. I	lollow	Stem	Auger	PZ-	304-AS	
						<u> </u>		·····		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			SHEET		2
						-	SAMPLING METHO			*****************************			<u> </u>	of 2	LAYNE-WESTERN
		LA	IDLA	v/ous	RI-FS/MQ	L	SPLIT SPOON						- 	BLLING	.ve:
		W			LANDFILL UNIT 2	-	SHELBY TUBE	3.0 Inch	O.D./2	13/16	inch	I.D. (SH		FINISH	Ę.
					MICHAEL TO SERVICE AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON AND ADDRESS OF THE PERSON ADDRESS OF THE PERSON AND ADDRESS		WATER LEVEL		<u> </u>				TIME	TIME 12:10	Š
					,	-	TME	<u> </u>	┼			1	DATE	DATE	
	ORTHI					_	DATE CASING DEPTH	<u> </u>	 					5 9/27/95	اہا
DATUM E		IG: 5		4.57	ELEVATION 451.4			<u> </u>	<u> </u>		-	<u> </u>		1	CONTR
·/··	90°	1E_ /-	3U	BEARIN	P NA	2016	ACE CONDITIONS	***************************************	/ W / W / W / W / W / W / W / W / W / W	PRESIDENCE -					Ś
SAMPLE	-			DUP TO S	137			***************************************							
	1	Ì 🗆		T					· · · · · · · · · · · · · · · · · · ·	Т					2
DEPTH IN PEET (ELEVATION)	BLOW/ 6 IN.	RECOVERY	SYLEGA	ER SYMBOL		ÄND	UMBER I F WATERIAL				SMIPLER TIPE		REM	ARICS	DRILLING
	88	₩	SC;	SAMPLER							3				
***	T4	l pr	ПП	11 7	(0.0-3.7 ft.) Loose, mo	ndern	te velinwish				\neg				
1 2	4	5,0° 1,8°		M	brown (10YR 5/4), SIL1 (FILL)	T, NR,	dry, (ML),			l					
1	7			H							SP	-31			z
				//	@ 0.6 ft, damp					ľ		3			11L TDN
2	 				(3.7-6.8 ft.) Compact, (5Y 4/1), SILT, NR. dar	olive Mp, (M	Dray			- 1	_				E)
=	6 8 7	15' 20' K75%		M	e 6.0 ft, trace organ					Į		31			_
— 3	B	(,21)		M	<u> </u>						SP				HARRINGTON CHK'D BY
5 5 6										1	2	31			HARRIN
4															,
	3 4 5 6	1,7° 2.0°		M						l	ļ	31			ක්
<u> </u>	5 6	KBSXI		H							SP				
				//						Į(3)	= 1			10
6	1			且								=			¥ 10/9/95
	2 3 4	(85%) 5'0, 1'6,		M						l		31			E
	4	(85%)		H	75 D.15 4 PAY 1						SP		0.0 ppm	PID	
				/\	(6,8-10.4 ft.) Loose, o (5Y 4/1), fine SANDY S					(①	31			Si H
= _	1				(ML), (LDESS)							=			LOGGED
	Įż	(50%) (60%)		17						Γ		日			
	2 2 2	(80%)		H						1	SP	=			
9 9	٢			 -							3	3			
					8 8.4 ft, moist					1		=			
10	1	1.7'								r		==			
	3 5 5	1.7° 2.0° (85%)		M	(10.4-13.0 ft.) Loose, ((5Y 4/1), SILT, NR, da	olive	gray				SP	31			
11	5			Π	401 17 40 man 17 1119 mai	p, 1	The Part of the Pa				3	-=			
_				Ш						- 1	\subseteq				848
12	l.	14		\mathbb{H}						F					943-2848 304AS
- 7 - 8 - 9 - 10 - 11 - 12 - 13	24	1.6° 2.0° (80%)		M								=	0.0 ppm	PIN	943-2 PZ304AS
-13	Įŭ			// -	(13.0-14.2 ft.) Loose,	alive	ardv	(4)	38.4)		SP 7	크ㅣ	ատ երչ		2
-	1				(5Y 4/1), SILTY fine S					ľ	7	31			
14	[_	[,		 	(SM), (ALLUVIUM)			(4	37.2)	14.2	_	4			JOB NO.: FILENAME:
	57	1.7° 2.0°		M	(14.2-27.) ft.) Compactolive gray (5Y 6/1), F	t to	dense, light	- Internation			SP	31			89
	10 20	KB5X)	:::	71	(SP), (ALLUVIUM)					۱ ا	B)				, , ,

	4	_			A A A A A A A A A A A A A A A A A A A			SO	L	30F	REH(DLE	LOG	1		1
SITE NA					A Secretary Description		-	DRILLING METHO 4.25 inch 1.D.		:h (J.D.)	tallow St	en Auger	SORNG PZ-3	NO. 504-AS		
1													SHEET		_	
							_	SAMPLING METH					2	o r 2	LAYNE-VESTERN	
					RI-FS/MD		-	SPLIT SPOON	***					KLING	VES	
		``			ANDFILL UNIT 2		F	SHELBY TUBE	: 3.0 inc	h 0.D./2	13/16 in	ch I.D. (S	H) START	FINISH	볼	
							-	IME IME	 		_		10:10	1240	LAY	
							-	DATE	 	╂			DATE	DATE		
DATUM	NDRTHI EASTIN	NG:	106814 51443	6.47 4.57	ELEVATION 4	51.4		CASING DEPTH	†	<u> </u>				5 9/27/95	a.	!
DRILL RI	G CM	IE 7					SURF	FACE CONDITIONS		400 Marian Contraction						
	90.	·····		BEARING	l NA			***************************************		·	4				၂ ႘	
SAMPLE	HAMME	R T	Γ	L			***************************************						· · · · · · · · · · · · · · · · · · ·	·····	ပ္	:
DEPTH IN FEET (ELEVATION)	BLOW/ B N. CN SAMPLER	RECOVERY	SYMBOL	SAMPLER STAROL	OR		AND	HAMBER) IF MATERIAL			SWALER TIFE		REW	RKS	DRILLING CONTR	
16 - 17 - 18 - 19 - 20	9 15 17 11 5 6 14 24	1.4° 20' (762) 1.8° 20' (702)		X X A	(14.2-27.1 ft.) Co olive gray (5Y 6 (SP), (ALLUVIUM) 8 17.7 ft., moist 8 18.0 ft., wet	impact /1), fi	t to ine Si	dense, light AND, NR, damp,	***************************************		5 ¹ (B) (B) (B) (B) (B) (B) (B) (B) (B) (B)		0.0 ppn Slight bi ador		B. HARRINGTON	CHK'D BY B. TILTON
20 21 22 22 22 23	14	1.7' NO' (85:0) (85:0) (85:0) (1.5) (1.5)		X							5P (II)		0.1 ppm F	o I D	LOGGED BY	DATE 10/9/95
24 25 25	9 5 14 15	(80%) 5:0, 1:6,									2P (13)					ī
26 27 28 28	5 11 12 13	1.2° 2.0° 6000		M	(27.1-28.0 ft.) Co (5Y 4/1), f-m SAM (ALLUVIUM) End of SoA Borel	ID, NR,	, wet,	, (92),	(4	23.4) 8	SP (14)		0.0 ppn f	TD.	JOB NO.: 943-2848	FILENAME: PZ304AS
												=		Ī	ᅙ	문

Boring No. X-Ref: PZ-304-AS

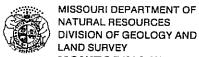
PIEZOMETER CONSTRUCTION SUMMARY

·		thing: 1068146 ft.	Elevation Ground	***************************************	t. NGVD
8 8	Eas	ting: 514435 ft.	Top of PVC	Casing <u>453.71</u>	ft. NGVD
° F	Drilling Summary:		Construction Tin	ne log:	
				Start	Finish
		3.0 ft.	Task	Date Time	Date Time
	Borehole Dlameter 8 1/4" Casing Stickup Height	2.31 ft.	Drilling CME 750	o tentos	on the ball of the
	Driller Layne-Wester		ONIE 730	9/27/95 10:10	9/27/95 12:10
-10	St. Louis, MO		<u> </u>	**************************************	
			Geophys.Logging:		
	Rig CME 750		Casing:		
	Bit(s) 4 1/4" ID Hollow S	tem Auger Bit	2* 1.D. PVC	9/27/95 13:40	9/27/95 13:45
**************************************	Drilling Fluid None				the companies of the co
-20	(And)	······································	Filter Placement:	9/27/95 13:46	9/27/95 14:30
	Protective Casing 8x8"	Square Steel, by 5' long	Cementing:		
		····	Development		
	Well Design & Specifica	itions	Bentonite Grout Bentonite Seal	9/27/95 14:30	9/27/95 14:45
المستحدث المستحدث المستحدث المستحدث المستحدد الم	"			***************************************	321133
-30	Basis: Geologic Log X Casing string(s): $C = Casing$	***************************************	Well Developme	T) Š	
	Casing String(s): C = Casing	3 0 - 00:00!!	Well Developine	186	
	Depth St	ring(s) Elevation			
	+ 2.31 - 17.10 C			**************************************	
~	17.10 - 26.90 S	······································		m, 4 minuti Metalia Gerrit 2 minuti 1 m	
	26.90 - 27.20 C	2 424.50 - 424.20			
			Stabilization Tes	t Data:	
·	-	***		t movered.	
1			Time pH	Spec. Cond.	Temp (°C)
-	Casing: C1 2" dia. Sched	The state of the s			
-50	flush threaded		***************************************		
	C2 2" dia. thread: (4" long or 0.3	Annual Control of the			
		ule 80 PVC, 0.010" machine			
		hreaded with O-rings			
	0				(40/14/04)
-60	Sand Pack: 16-35 mesh S	IIIca Sand 12.8-28.0	Recovery Data:		
	Filter Flenks 100 mach Cilia	a Cand 44 5 40 67			
	Filter Pack: 100 mesh Silic	a 3anu 11.5-12.6	100		
	Grout Seal:		_ 80 _ 70		
	Grout Seat.		80 50 50 50 50 50 50 50 50 50 50 50 50 50		
70	Bentonite Seal: Extra	high yield Wyo-Ben (100%)	39 40		
	Slurry 3.0-11.	<u> </u>	30 20		
	Concrete: 0.0-3.0'	*	10 0 20		
	VUILLIE. V.V-3.V			+0 60 4⊏ (Minutor)	80 100
	Comments:		111	ME (Minutes)	
-80	Syzemicino.	**************************************	W/44/\}		The spirit straints of the miles of the spirit spir
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		m-44	is quantities of the control of the	, , , , , , , , , , , , , , , , , , ,	
				MARKY No.	
Not to Scale	Consensation R Mar	rington	LAIDEANIOLIA DE COB		

File Name PZ304AS

Job Number

943-2848



· · · · ICE USE ONLY	DATE RECEIVED
REF. NO. 145102	
C.A. NO.	снеск ио.
STATE WELL NUMBER	TRANSMITTAL NO.
CHECKED BY	HOUTE
APPROVED BY	ENTERED

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	MONI	TORING	W	ELL				CHECK	KED BY	•			HOUTE				
	CERT			APPRO		Υ .			ENTEREC) 		Ph 2	Ph 3				
INFOR	MATION SUI	PLIED BY	МО	NITORI	NG WE	LL CO	NTR								·		FN3
l .	_	IDGETON	1 5	ANITA	ey L	かいし に	-14-		L NUMI	вен Э.Е 3 С	445						
SITE ADD							CITY						STA	NTE		ZIP CODE	
OWNER N	CHARLES	5 KUCK	[2]	<u> </u>				Br	SIDG	一十二	1			Me		634	44د
		ASTE	54	Mara	3, IL	ı c .] I EL	TELEPHONE 314 - 241 - 3710			
OWNER A					· · · · · · · · · · · · · · · · · · ·	(YTIC		- 1				STA			ZIP CODE	
	35 N. B	DATE ISSUED						[د:=	_	.4UIS			Mu 63102				
VARIAN	=	VARIANCE NU							SHO	ATION O	ON IN	L	eum	EACE C	COUN		: <u>Louis</u> 51.4
	E LOCATION O]		٧	DE 401 E	TO 140				TION PLAT	•		SUH	PAGEE	LEVALIC	JN	
	WEST								H T		SMALL	EST ¼				1.A	RGEST %
50	UTHWEST	FENICE	یے	>IZNE	<u>ے ہے۔</u>	HE [F]								%		٧.	<i>y.</i>
							1			لتلت	SEC.		WN	47	N D	NG	
							•									_ <u>26.</u>	
***************************************				·					LA1.					JNG	9 <u>1-1-1-1</u>	_20,	<u></u> "
	ORING WELI IACTOR'S NA		ATIC	ON A	VAE	WE	57 2 5	E2.1	C,	عدر المح	_			RMIT MBER	_ ا	יי בובא	B WPM
	NG CONTRA													RMIT	+		- 40 F(2)
NAME				ما						6., IN			NU	MBER	ت	ಲ1355	MPM E
TYPE ☐ MONITORING WELL TYPE OF ☐ HAZARD										NFORM		NITORING	FOR: (C	HECK AL	L THAT A	(PPLY)	
OF WELL	PIEZOME			POTEN-	127 I A			OT OT			⋈	v.o.c.	□м	ETALS			M PRODUCT
PRO-	OTHER	ER OF		<u> </u>	S.T.	nl inii	NTS .				OTHER		ONLY				
CASING			SDR #	DEPT	HOF			ANICA	THR L 🔲 WEL		l				H A YES		
DETAILS 5 FT. 8X5 IN.					<u> </u>	HOLE IN		OTHER				TYPE					
CAP VENTED MAT				CEMEN	т	TOTH	IE BOT	A THE SU TOM OF OUT SEAL	THE	TYPE OF		30VE		DESCR	IBE HOW RUCTED	THE FLUSH	MOUNT WAS
	WEEP HOLE?	DETAIL	s Z	CONCR						SURFACE COMPLE- TION	□ FL	GROUN .USH	D	-			 ,
	区YES 口1		ᆜᆜ	OTHER		-	3.0		FT.	1108	1	MOUNT					
CENTRALIZ ON RISER	KER USED N	-	D AT					MATERIAL STAINLESS STEEL			i 🗆 (OTHER .			*****		
RISER	LENGTH	DU	METE SER PI		WEIGH SDR #	т оя	DIAL	AETER OI L HOLE	F	JOINTS		🗵 тня		MATER	IAL	▼ THERM	IO PLASTIC
PIPE DETAILS	24,3	FT.	2	_	· Sch	u.				☐ MECH		. WEL	LDED ST			☐ FLUOR	O POLYMER
	☐ CEMENT	SLÚRRY					TE SLURRY			MATERIAL		L		LENGTH		BENTONIT	
ANNULA SEAL		ITE SLURRY JRRY BENTON		BAGS (OF NT USED			BENTONITE BEN		BENTO:				SEAL		INSTALLED	TURATED
	TYPE:	MAT BENIUN	——		ITONITE I R USED/B		.GAL.	35	iAL.	GRA		_	HIPS		5	ZQ!	1Ε
PRIMARY	TYPE		GRAI	N SIZE	LENGTH			METH		\		lion in this	FEE	<u> </u>		Marin	RATED ZONE
FILTER PACK	MANUFA	ACTURED	.,		PAUK	٠		Ι.	LLATIC		supplier from Su	in the Fee		M		FORMAT! DESCRIPT	ON ION
	TYPE	<u> </u>		N SIZE	LENGTH		FT.	METHO	OD OF	Pour	column		╂	 _	- (3		
SECONDA FILTER PACK	MANUFA	CTURED			PACK	_			LLATIC			o bottom of ve Casing	:	"	~ [D ·	J11T	
	NONE LENGTH OF S			ETER	SLOT SIZ	3 E WEIGI	FT.	MATE!		್ಲ ಕ್ಲ	Seal;		3.0	<u> </u>			
WELL SCREEN				,		SOR #			ASTIC	:			- + ±: 4+				
	LENGTH OF S	FT.	2		10	10C			UORO	POLYMER	Annular	Base of Seal:	11.5	<u> </u>			
SUMP DETAILS		OMP	DIAM	ETER OF SL	IMP	MATE	VC		STEEL	-			-				İ
DETAILS							LUOR	O POLY	YMER		Depth to Bentoni	Base of le Seal:	11.5	;			
BACK	WAS THE WEL FILLED?	L BACK	MATE	RIAL USED			TH O	F BACH E	K FILL	ED	Depth to			_			
FILL	YES 🖾	NO										Filler Pack			. 7A	Sand	
STATIC WA		EET FROM IEASURING POI		ULTIPLE CA							Depth to Screen;	Tep of the	18.		دین عد - ر	- MI & J	
DATE OF ST	ATIC WATER LEVE			JBMIT ADD DNSTRUCTII ASING, HOLE	ON DETAIL	S INCLL	DING	TYPE A	SHOWI ND SIZ	ING WELL SE OF ALL							
	POINT FOR STATI	C WATER LEVEL	. IS Di	RILLING EQ	UIPMENT				ı			Bollom of	20				
ш торо □ отнег	F RISER PIPE			AIR ROT	TARY 🛭	I AUGE	R TY	PE <u>4'</u>	14 F	I. 5 ,Α.	the Scre Total De		28. 28.	<u> </u>			
	OF MEASURING P	DINT	75	REVERS] отне	R					ELL DAILL			ETED (1-27-9	<u> </u>
HEREB'	Y CERTIFY TH	IAT THE M	TINC	ORING V	VELL HI	EREIN	DESC	CRIBE	D W	AS CONS	TRUC	TED IN	ACCO	RDANC	E WITI	THE DE	PARTMENT
JF NATU	RAL RESOUR	CES REQUI	REM	ENTS FO	R THE C	CONST	RUC	TION	OF M	ONITORI	NG WE	LLS.					

SIGNATURE PRIMARY CONTRACTOR/PERMIT *

DATE

SIGNATURE DRILL ENVERMIT *

11-15-95

DISTRIBUTION: WHITE/DIVISION CANARY/MONITORING WELL CONTRACTOR CHK/OWNER

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ENCLOSE \$35 PER MONITORING WELL FOR THE CERTIFICATION FEE WITHIN 60 DAYS AFTER WELL COMPLETION

11-15-45 ∰ acicio Mas

Project Na	WESTLAKE				Boring No.	- 82
Project No	84-075-4-002			÷ *	Page	of 2
Ground Ele	447.7 NW Central	sec hem	of Sit	e: Fg I-2	Total Footag	56.5.
Orilling SEE		No. of	Samples	No. Core Box		o Water Date Measured
REMA				0		ARKS -
Drilling Co	WABASH DRILLING CO.		Driller (a	DOR	L THO	RNTON
Drilling Alg	ACKER MP-5, TRUCK		Type of Penetral	ion Test	STAND	ARD .
Date	8-24-84 TO 8-27-84		Field Ob	server (s)	GLEN E	RNATMANN
Depth	Description	Claux.	Blow Count	Recov.	Semple or Box No.	
, 2 3 4 5 4 7 8 9 10 11 12 11 11 11 11 11 11 11 11 11 11 11	BROWN SANDY CLAY, SOME GRAVEL MEDIUM PLASTICITY STIFF TO VERY STIFF, DAMP TO MOIST (FILL) BROWN FINE SANDY SILT, LOW TO NON- PLASTIC, STIFF, MOIST TO SATURATED		5/4 /l	/8" G	55-7	S" SOLID AUGER O' TO ZD'. SATURATE D MATERIAL ENCOUNTERS O 11. TO 13. TO 17.
/3 =	LIGHT BROWN FINE TO MEDIUM					

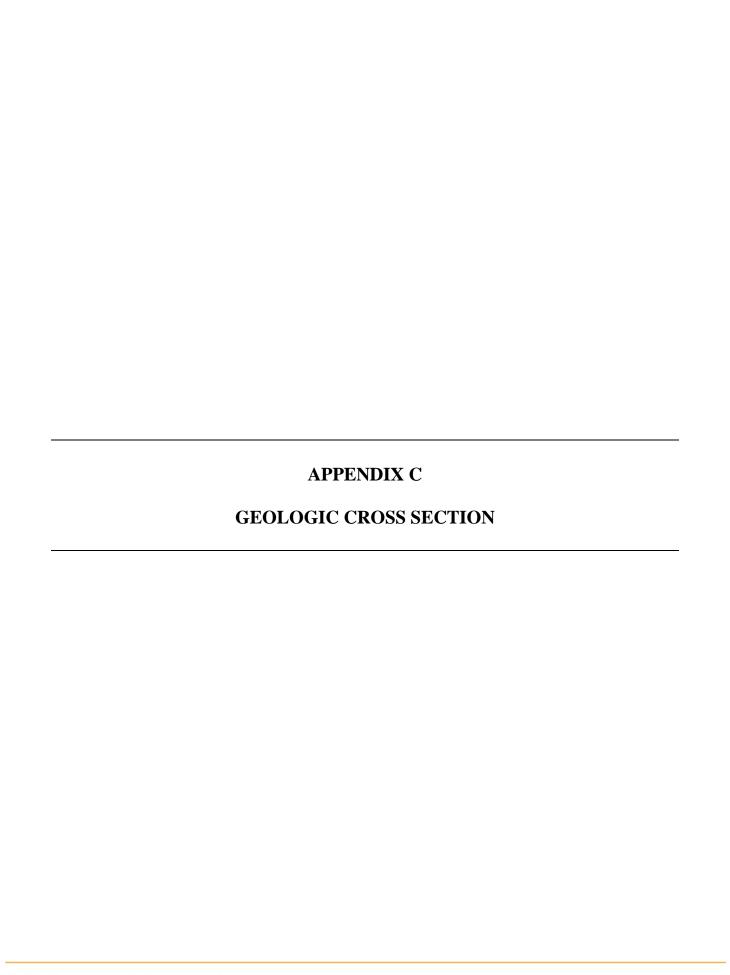
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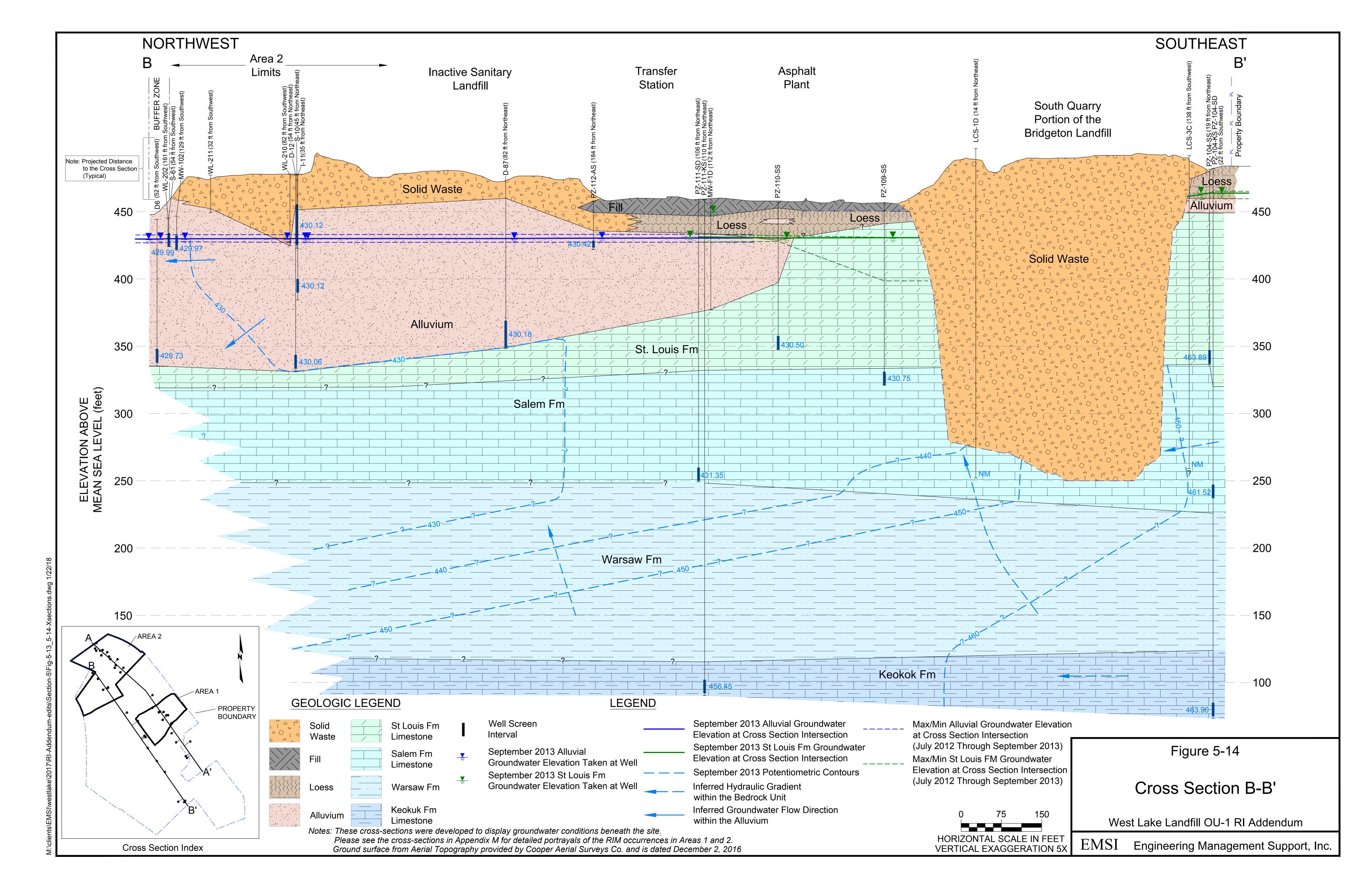
Burns & MCDonnell

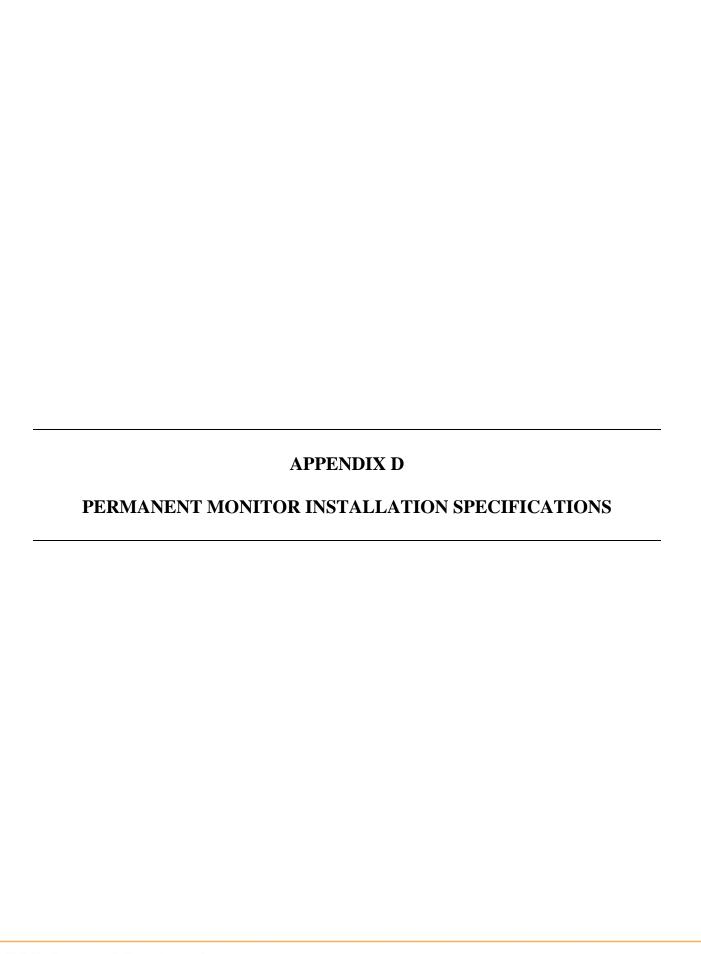
Form TS-GT-2-1-7

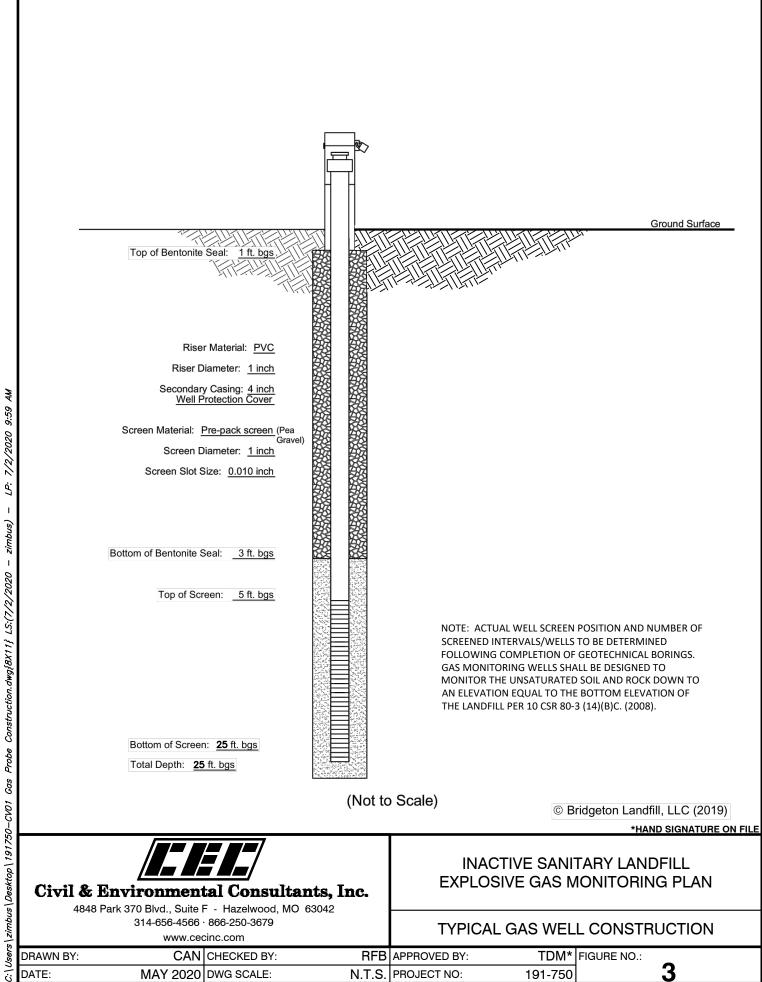
Drilling Log (continued)

	,					Boris	ng Na. 5-82
Project l	Name WESTLAKE					Page	Z to Z
roject i	No. 84-075-4-002		y 			Date	8-27-84
Depth	Description	Log or Class	Blow Count	Core Recov. & Loss		Box or Sample No.	Remarks
15	BROWN SILTY CLAY MEDIUM PLASTICITY, UERY STIFF, MOIST	'	3/2/3	16" 79"	gr.a.	<u>∕</u> 5≤−3	•
17	BROWN-GRAY SILTY FINE TO MEDIUM SAND, MEDIUM DENSITY, SATURATED						TATURATED MATERIAL BELOW APPROX, IT TO 18'.
20 =	•		4/7/12	15"	20-0	55-4	CASING WAS DRIVEN TO 20' & HOLE WAS WASH - BORED FROM 20' TO 25',
23	antivationing situationspaces security and a securi			The state of the s	· _	<u>мас</u> моружение в сов	RESUMED 8-24-84 RESUMED 8-27-84 NOTE; HOLE HAS COLLAPSED TO 13.3' BELOW G.S.
24	GRAY-BROWN COARSE SAND, SOME FINE TO MEDIUM SAND, MEDIUM DENSTRY, SATURATED PRIMARILY QUARTZ, SOME CHERT FRAGMENTS AND MAFIC MINERALS	energy and the control of the contro	7/4/	17*	25.0	 SS-50	A 2" dia. PVC prezometer was installed to 25.5' pvc is flush - jointed threaded
27=	GRAY, SILTY FINE TO MED. SAND, SATURATES		29	18"	35 £	<u> </u>	couplings.
29 =			- The second second second second second second second second second second second second second second second				Seal above, Anulus is grouted from seal to surface Tio.P. 15 3.0° above ground surface, WATER LEVEL 15 18.2°
11479	Borns &	<u> </u>		ACCORDINATION AND THE STATE OF			BELOW TOAL IMPERIANT AFTER PIEZOMETER INSTALLATION 1:45 pt B-27-64, Form TS-GT-2-









RFB APPROVED BY:

N.T.S. PROJECT NO:

TDM* FIGURE NO.:

191-750

DRAWN BY:

DATE:

CAN CHECKED BY:

MAY 2020 DWG SCALE:

1.0 DRILLING

1.1 Nominal Boring Diameter

In all cases where the diameter of the well pipe will be 1.0 inches, the minimum nominal borehole diameter of borings advanced through soil materials will be 5.0 inches in order to help ensure that the minimum width of the annulus around the well pipe will be 2 inches.

1.2 Drilling Methods

Borings should be advanced with drilling technology appropriate for the subsurface conditions at the site. Drilling methods shall facilitate extraction of drill cores for physical examination and classification of soils relative to gas transmission potential.

1.3 Cuttings

Drilling will be performed in a manner that minimizes the spreading of soil cuttings. Disposition of cuttings upon project completion will be the responsibility of Owner/Operator or the Owner/Operator's designated representative. Cuttings will be disposed of in accordance with applicable site and or local regulatory requirements.

2.0 SOIL SAMPLING

2.1 Drill Cores

During borehole drilling, the driller will attempt to retrieve continuous drill cores for physical observation. If any drilling interval is interrupted and a continuous core not retrieved, such intervals shall be noted in drilling logs including interpretation of probable stratigraphy based on core samples above and below the interrupted interval.

2.2 Sample Disposition

Disposition of sample material upon completion of the project will be the responsibility of the Owner/Operator or the Owner/Operator's designated representative.

3.0 GAS WELL CONSTRUCTION

3.1 Gas Well Pipe and Screen

Each monitoring well will be constructed of pre-cleaned Schedule 40 PVC pipe having an inner diameter of 1.0 inches (minimum). The use of threaded joints is recommended for all installation. The base of each well will terminate with a screen 10 feet in length unless otherwise required by project specifications. Screens will be factory-slotted. Slots will be 0.01 inch in width (maximum).

All personnel handling well materials will wear clean nitrile gloves and shall utilize appropriate decontamination procedures between drilling locations. All drilling equipment and materials shall be maintained in a clean manner.

Use of PVC pipe cutters is recommended whenever necessary to shorten sections of the PVC well pipe. Use of hacksaws or similar cutting implements is not recommended.

3.3 Sand Pack

Filter sand will be a clean sand of proper size in relation to the screen slots to prevent its passage into the well, with no fraction coarser than 0.25-inch nominal diameter.

Filter sand will be placed in the annulus around the well riser and to a point approximately 2 feet above the top of the screen. A tremie pipe shall be used whenever feasible for sand placement in excess of 10 feet.

3.4 Bentonite Seal

The annulus around the well pipe will be sealed with a layer of bentonite pellets, to be placed

directly above the sand filter pack. The minimum thickness of the bentonite layer will be

approximately 2 feet. The bentonite pellets should ideally be allowed 24 hours for hydration prior

to continuing with well construction. A tremie pipe will be used where feasible for seal depths in

excess of 10 feet.

3.5 Grout

Following hydration of the bentonite seal, each boring will be sealed with a Portland Type I

bentonite/cement slurry, using the tremie pipe method or a bentonite slurry grout if required by the

project.

Bentonite content in the cement slurry will be 2 to 5 percent by weight to help reduce shrinkage.

3.6 Surface Completion

All wells shall be completed as stick-up installation including use of a locking protective casing

and concrete apron. The PVC riser will be provided with a slip type end cap. The end cap shall

be fitted with a threaded stainless steel ¼ inch quick connect type fitting. The PVC riser (well

pipe) will extend to an approximate height of 1.75 feet above the top of the concrete pad.

An outer locking protective casing shall be mounted within the concrete apron leaving

approximately 2 inches of clearance to the top if the PVC riser. The driller will provide a lock for

each protective casing. All locks will be keyed identically and all keys relinquished to the owner.

The apron will be constructed in such a manner that surface water will not return to it. The concrete

apron will have the following minimum dimensions: 3 feet x 3 feet x 3.5 inches, and will be

centered with respects to the riser and protective casing. A form will be used in constructing the

apron. The upper surface of the apron will be graded to provide drainage away from the PVC riser.

A spike will be set into the pad for surveying purposes.

The outer protective casing will be constructed of steel pipe having a diameter, or diagonal, of not less than 8 inches. A drain hole having a diameter of 0.5-inch will be drilled through the outer protective casing near the top of the concrete apron. Shavings generated by drilling the steel casing will be prevented from falling into the well. The casing will be marked for surveying purposes.

4.0 SURVEYING

A licensed surveyor will survey each gas well elevation. Survey point(s) will include:

- concrete pad (marked with a spike) within + 0.01 foot;
- outer protective steel casing, when open (engraved mark);
- inner PVC well pipe (engraved mark) within \pm 0.01 foot;
- ground surface (not marked);
- well location to within + 0.5 foot in horizontal plane; and,
- ground surface elevation to within \pm 0.1 foot.

5.0 WELL DEVELOPMENT AND INSPECTION

Not required unless dictated by specific site conditions.

6.0 ANCILLARY REQUIREMENTS

6.1 Extraneous Material

The driller will take all reasonable care to ensure that each boring is free from all materials other than those required for well construction. Materials required for well construction is here defined to include polyvinyl chloride (PVC), sand, bentonite, Portland cement and natural soil materials. All other materials accidentally or purposely placed in the hole will be removed by driller prior to well completion.

6.2 Decontamination

All drilling equipment (drill steel, bits, casing materials) and any additional equipment, that

contacts subsurface formations may be decontaminated prior to on site use, between consecutive

on site uses, and/or between consecutive well installations, as directed by Owner/Operator or

Owner/Operator's designated representative.

Appropriate decontamination procedure will consist of steam cleaning with potable water and

biodegradable detergent (e.g., Alconox) approved by Owner/Operator or Owner/Operator's

designated representative. Steam cleaning will be conducted in a manner that minimizes over-

spray and runoff.

6.3 Disposition of Waste Water

If drilling fluids are used or monitoring wells constructed in an area of suspected contamination,

well development wastewater will be placed in 55-gallon drums at the well site and subsequently

disposed by the Owner/Operator.

6.4 Site Safety Plan

The driller is responsible for maintaining the personal safety of his employees while on site. The

driller shall provide a copy of the project safety plan for review by the Owner/Operator no less

than 7 days prior to commencement of field work.

6.5 Cleanup

The driller will be responsible for removing all refuse from each well site. Such refuse typically

includes, but is not limited to, PVC pipe wrappers, sand bags, bentonite bags, cement bags,

beverage containers, food wrappers and other forms of litter. Smoking on site will not be permitted.

The driller will be responsible for providing the following information to the Owner/Operator's designated representative after well installation has been performed:

- date and time of construction;
- drilling method and fluid used (if applicable);
- boring diameter;
- well pipe (inner casing) specifications;
- well depth (+/-0.01 ft.);
- drilling/lithologic logs;
- specifications for other casing materials (if applicable);
- screen specifications;
- well pipe/screen joint type;
- filter pack specifications (material, size);
- filter pack volume and calculations;
- filter pack placement methods;
- bentonite seal specifications;
- bentonite seal volume;
- bentonite seal placement method;
- grout specifications;
- grout volume;
- grout placement method;
- surface completion specifications; and,
- well development procedure.

7.0 WELL CONSTRUCTION AND SOIL BORING LOGS

Certified copies of well construction and soil boring logs will be forwarded to the MDNR by the driller in accordance will applicable requirements following completion of well construction activities.